METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD & COPPER AND BRASS

BRASS FOUNDER and FINISHER

ELECTRO-PLATERS REVIEW

VOL. 30 NEW YORK, APRIL, 1932 No. 4

Foundrymen Will Hold Technical Meeting in Detroit

By F. J. HUNTLEY

Detroit, Mich.

Sessions to Be Held at the Statler Hotel. The Importance and Growth of Detroit as a Foundry Center

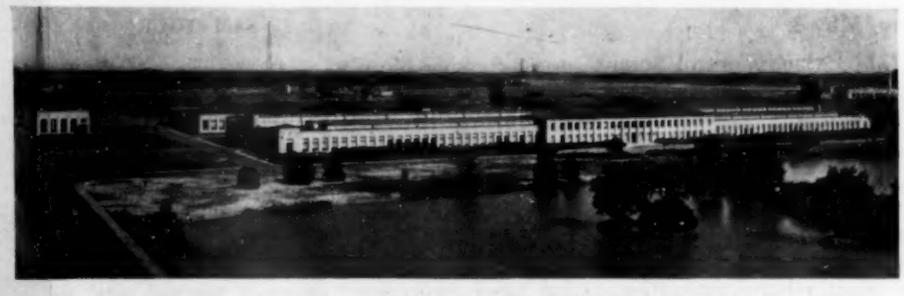
WHEN the American Foundrymen's Association convenes in Detroit from May 2 to May 5, at the Statler Hotel, members of this fine old organization will discover that the foundry industry, as it pertains to the industrial area along the Detroit river, has expanded greatly since they met in the same place from September 21 to October 1, 1926.

New plants have been erected and old ones expanded. New furnaces built and new equipment brought into use. This is all particularly true as it concerns the non-ferrous metal industry. It was an almost continuous development until late in 1929 when economic conditions generally began to slow up. But it was more than a year later before the full force of the change was seriously felt. At that time the automobile industry let down rather abruptly. Then followed a general industrial drag. The non-ferrous foundry men at this moment are still struggling to ease the friction of this drag. It has been a slow and trying process, but prospects are brighter on the eve of this convention than they have been for many months.

The motor car manufacturers, as might be expected, are making herculean efforts to get back again into substantial production. And it is a pleasure to add that they are making real progress. The spring of 1932 can not help but be the most promising of the last two or three years.

As everyone knows the motor car industry is the backbone of the foundry industry in the Great Lakes industrial area, and along the Detroit river in particular. With all the big motor plants gradually getting back into production, it is natural to expect the foundry industry will follow in precisely the same way. And it is.

The business disturbance, however, has resulted in the institution of many economies—such, as for instance, labor saving devices and new methods. This of course has reduced manufacturing overhead and made it possi-



Engineering Laboratory, Ford Motor Company, Dearborn, Mich.

ble to produce and merchandise motor cars at a cost that seemed impossible a few years ago.

One of the great strides in reducing costs is demonstrated in the foundries of the Ford Motor Company. The Ford laboratories during the last two years have made almost unbelievable progress in perfecting new methods and equipment.

Detroit today ranks fourth in the United States in the number of foundries, with more than 100 under production. Ahead of Detroit comes Chicago with more than 200. Cleveland is second with about 200, and New York, with approximately 110. Philadelphia has about the same number as Detroit.

Michigan, taking in all classes of metal work, is credited with about 115 exclusively brass and 110 non-ferrous foundries which are departments of other establishments. Besides, there are reported 158 aluminum foundries. These figures show vividly the growth of the foundry industry in Michigan in a little more than 70 years.

It also is interesting to note at this time that Detroit ranks third in brass production. The city has 70 brass foundries, compared with 109 in Chicago and 73 in New York.

The first brass foundry in Michigan was established in 1837 in Detroit, by Soloman Davis, father of George S. Davis who was, in turn, one of the founders of Parke Davis & Co., the great pharmaceutical manufacturers. Soloman Davis specialized in church bells, several of which still are in existence in Detroit.

Henry Ford's foundry at River Rouge is said to be the largest of the kind in the world, covering 30 acres or more. This plant is a model in every way. Conveyor systems for the transportation of all materials are said to be the most complete in the industry. Molds are built along conveyors which carry them from workmen to workmen. Hot metal is poured into one-ton ladles suspended by chain hoists from overhead tracks. Along these it is swung to pouring stations. The charged mold then swings over upon the return of the conveyor for its trip to the "knockout" stations. From these the still hot casting is transferred to a conveyor which delivers it to the cooling racks.

The Packard Motor Company operates five large foundry plants, three of which alone costs $2,000,000. These foundries cast aluminum, brass and iron. They are arranged for continuous operation. One sand handling and storage department supplies them all. There is a single core making, baking and finishing department effecting great economies in operation. A single operator in the Packard foundries, with only the aid of a helper, fills the cylinder molds assembled on roller conveyors. The old hand method required 21 men.

Detroit Metal Foundries

Among the outstanding foundries in Detroit specializing in bronze, aluminum, brass copper and grey iron are the Alloys Foundry Company, 192 Mt. Elliott Ave., Anchor Brass Foundries, 1431 Church Street; Art Brass & Wire Works, 407 East Fort Street; Barton Brass Works, 3627 Superior Street; Bohn Aluminum & Brass Corporation, 2512 East Grand Boulevard; R. P. Carolin, 3633 Military Avenue; City Brass Foundry Company, 1979 Macomb Street; Detroit Aluminum & Brass Corporation, 3975 Christopher Avenue; Detroit Die Casting Company, 284 Iron Street; Eastern Foundry Co., 520 Orleans Street; France Foundry & Machinery Company, P. O. Box 601; Hackett Brass Foundry, 1202 Lillibridge Street; LeRoy-Broehm Foundry Company, 3126 East Jefferson Avenue; Magnus Company, 3501 Griffin Street; Wood Detroit Manufacturing Co., 2970 Twenty-fourth Street; Marx Brass Works, 290 Meldrum Avenue; Michigan Smelting & Refining Company, 7885 Jos. Campau Avenue; Walter C. Nagel Foundry Company, 2978 Twenty-fifth Street; National Alloys Company, 2118 Woodbridge Street; National Bronze & Aluminum Castings Company, 3530 Garfield Avenue; Nelson Foundry Company, 1984 W. Lafayette Boulevard; Frank J. Novak, 1545 Temple Avenue; Racine Foundry & Machinery Company, 6535 Dubois Avenue; Schmandt Foundry Company, 6400 Miller Avenue; Sherwood Brass Works, 6331 East Jefferson Avenue; Star Foundry Company, 7185 Hillger Avenue; Superior Brass Works, 312 South Crawford Street; United States Aluminum Company, 3311 Dunn Road; Williams Foundry, 2996 Hubbard Street; Hensley Trolley Manufacturing Company, 2779 W. Kirby Ave.; Michigan Valve & Foundry Company, 3631 Parkinson Ave.; Grant Brothers Foundry Company, 2931 Beaufait Avenue; Columbia Castings Company, 111 Ferdinand Avenue; D. J. Ryan Foundry Company, Ecorse, Mich.; Detroit Bronze Bushings Company, 1060 Beaufait Street, Wolverine White Metal Works, 3421 Gibson Street.

Tentative Program for Nonferrous Metals

Monday, May 2

Registration.
Committee Meetings.
Plant Visitations.

2:00 P.M. Sand Control Shop Course—Session No. 1.

Tuesday, May 3

9:00 A.M. Sand Control Shop Course—Session No. 2.

9:45 A.M. Opening Meeting of Convention.

10:30 A.M. Nonferrous Founding:

"Refractories in Brass Melting Practice," by A. E. Rhoads, Detroit Electric Furnace Company, Detroit.

"Phosphorus in Red Brass," by R. W. Parsons, Ohio Brass Company, Mansfield, Ohio.

"A Method for Study of Shrinkage and Its Distribution in Castings," by N. B. Pilling and T. E. Kihlgren, International Nickel Company, New York.

1:00 P.M. Nonferrous Cast Metals—Round-Table Discussion.

SAM TOUR

Nominated for Chairman, Non-Ferrous Division, American Foundrymen's Association.

Chairman, William Romanoff, H. Kramer & Company, Chicago.

Vice Chairman, H. F. Seifert, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., and D. E. Broggi, Neptune Meter Company, Long Island City, New York.

4:00 P.M. Shop Courses:
Nonferrous Founding—Session No. 1.

8:00 P.M. Sand Research:
Reports of Committees.

"Grain Size and Bond Distribution in Synthetic Molding Sand," by A. H. Dierker, Engineering Experiment Station, Ohio State University, Columbus, Ohio.

"Mold Condition Control," by H. W. Dietert, U. S. Radiator Corporation, Detroit.

"German Sand Control Methods," by Dr. H. Ries, Cornell University, Ithaca, N. Y.

Wednesday, May 4

9:00 A.M. Sand Shop Course—Session No. 3.

10:00 A.M. Nonferrous Founding:

"Casting Properties of Nickel Bronzes," by N. B. Pilling and T. E. Kihlgren, International Nickel Company, New York.

"Influence of Design on Brass and Bronze Castings," by L. H. Fawcett, Naval Gun Factory, Washington, D. C.

Nonferrous Division Business Meeting.

12:30 P.M. Pattern Production Round-Table Discussion.

Chairman, Vaughan Reid, City Pattern Works, Detroit.

Modern Premium Systems Pertaining to the Pattern Shop. Pattern Production Standards.

2:00 P.M. Apprentice Training:

"How Much Does It Cost to Train Foundry Apprentices?" by J. Franklin Carlz, Clark Brothers Company, Olean, N. Y.

"Successful Foundry Apprenticeship in a Small Manufacturing Plant," by W. E. Rutz, Giddings & Lewis Machine Tool Company, Fond du Lac, Wis.

4:00 P.M. Shop Courses:
Nonferrous Founding—Session No. 2.

7:00 P.M. Informal Stag Dinner of American Foundrymen's Association and Foundry Equipment Manufacturers' Association.

Thursday, May 5

9:00 A.M. Sand Control Shop Course—Session No. 4.

9:30 A.M. Annual Business Meeting of American Foundrymen's Association.

2:00 P.M. Materials Handling (A.S.M.E. Cooperating):

"Monorail Materials Handling and the Foundry," by J. B. Forker, Osborn Manufacturing Company, Cleveland.

"Materials Handling for Miscellaneous Castings," by F. D. Campbell, Eastern Corporation, New York.

"Materials Handling in the Small Brass Foundry," by D. G. Anderson and B. F. McAuley, Western Electric Company, Chicago.

4:00 P.M. Shop Courses:
Nonferrous Founding—Session No. 3.

No Commercial Exhibits

The Association announces, by authority of the Executive Committee that there are to be no commercial exhibits under Association auspices. Commercial exhibits of any character will not be approved and firms who might exhibit at A. F. A. conventions are asked to plan accordingly. The attendance of manufacturers of foundry equipment and supplies is desired, however, and their cooperation is sought in making this convention a successful one.

Non-Ferrous Division Officers

The nominating committee, appointed by chairman Bolton of the non-ferrous division, has presented the following list of nominations:

Chairman to serve for two years: **Sam Tour,** vice president, Lucius Pitkin, Inc., New York City.

Vice chairman to serve for two years: **Jerome Strauss,** chief research Engineer, Vanadium Corporation of America, Bridgeville, Pa.

Three members of the advisory committee to serve for two years: **P. D. Merica,** assistant to president, International Nickel Company, New York City. **J. L. Wick, Jr.,** president and general manager, Falcon Bronze Company, Youngstown, Ohio. **D. H. Wray,** vice president, Henry Wray & Son, Inc., Rochester, New York.

Three members of the advisory committee to serve for three years: **H. F. Seifert,** superintendent brass foundry and copper department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; **E. R. Darby,** chief metallurgist, Federal Mogul Corporation, Detroit. **T. D. Stay,** Aluminum Company, of America, Cleveland.

Electric Furnace Patents

Supplementing our notice of November, 1930 (page 541), and February, 1932 (page 92), we are informed by Industrie Elektroofen of Koln a/Rh., Germany, that the sentence of the Kammergericht in Berlin was returned by the Reichsgericht in Leipzig, the highest German court, on November 21, 1931, forbidding Messrs. "Industrie" Elektroofen G.m.b.H., the further manufacturing of induction melting furnaces on amount of patents owned by the Ajax Metal Company in Philadelphia, but that by this same decree, Industrie Elektroofen was permitted to build induction furnaces under their own patents.

Some Causes of the Staining of Strip Brass in Process

By CHARLES K. SKINNER

General Electric Company, Bridgeport, Conn.

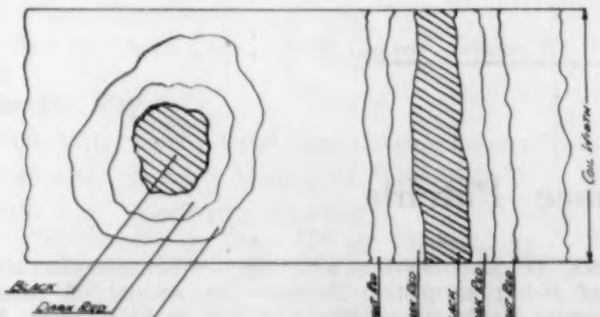
Staining of Strip Brass Occurs Mainly by Oxidation During the Anneal and Pickle. This Staining Can Be Avoided.

BY means of various experiments and observations the mechanism of the worst staining was deduced to be that of oxidation of the surface of the brass during the anneal followed by the chemical action of the pickle with this oxide to make a red stain. Hence in order to prevent staining, all other variables being regulated, the annealing and cooling should take place in a non-oxidizing atmosphere, and the coils should be well opened in the pickle so that no individual laps are in contact.

Discussion

Throughout the brass industry and, in fact wherever brass articles are worked, annealed, and pickled, the problem of staining is always one to be reckoned with. Probably stains are most prevalent in the sheet brass mill where, because of the nature of the processing, flat surfaces come in varying contact in both annealing and pickling operations; but the mechanism of staining and the methods of prevention are practically universal.

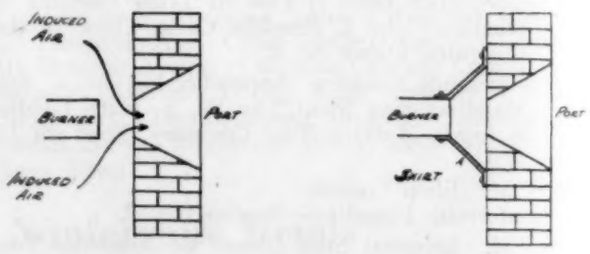
Three types of stain are common; brown, black, and red. All three result from the annealing operation alone and from the combination annealing and pickling operation. Some stains, of course, result on clean brass from age or corrosive exposure of sorts. In the sheet brass mill, where the annealing is performed in the batch oil fired furnace and the pickling carried on by placing several coils on racks in lead lined tanks full of sulphuric pickle, one has not far to seek the black scallop stains on bars out of the furnace, or the black and red stains on bars going through the run-down and finish mills. These are often severe enough to persist through the balance of the processing and can be eradicated at the finish only by the use of a strong oxidizing agent, such as bichromate of soda. On metal finishing for the hard tempers this strong surface etch, eating out the red stained portions, can be conveniently performed after the get ready anneal with no detrimental effect on the surface of the finished hard rolled brass; but where the stock is sent out annealed, the surface is of prime importance and such a harsh treatment is often disadvantageous to the further processing in the cutting up shop.



Diagrammatic Sketch Of Two Typical Stains From Pickling

Black Stains from the Anneal

Let us first consider the primary black stain. This stain, or the oxide layer, puts in its appearance wherever the metal is subjected to heat under oxidizing conditions. It is mainly cupric oxide—CuO—readily formed at the temperatures of ordinary anneals. An oxidizing anneal of 800 degrees C. will result in the formation of a heavier oxide layer than one of 500 degrees C. Of course the black oxide formation also depends upon the copper content of the metal, the oxide increasing with an increase of copper percentage. In some mixtures, copper, for instance, the layer is of such a thickness that it can be fairly well scaled off by an immediate quench after the anneal, but in the ordinary high brass mixtures it is of the close-clinging variety.



Method of Skirting Furnace Burner To Exclude Induced Air

Obviously the way to limit the formation of the black oxide is to cut down the amount of oxygen in the annealing chamber. In the commonly used oil furnace, oxygen

control is rather difficult as opposed to the comparative ease of control in electric furnaces. The oil types require that air be supplied to the burners for proper combustion, but, with the average air valves in use, it is never certain that just the correct amount of air is being supplied. Then, too, there is generally an induction of air about the mouth of the burners. Unless the damper position is carefully watched throughout the duration of the anneal, an unbalanced condition occurs in the chamber, resulting in a through draft, suching air and gases up the stack and supplying fresh oxygen to the heated chamber.

On the low temperature anneals this detrimental oxygen condition can be alleviated somewhat by closing all openings about the burners where induced air might find entry, by running the heat with the dampers closed, by using a long, hazy flame, and by keeping the furnace doors closed for the duration of the heat. These precautions enable the anneal to be completed with a minimum of oxygen present, the pressure in the furnace being maintained at a level slightly in excess of the pressure in the mill. A simple verification of the correct condition is to bring a lighted match to the peep hole. If the flame of the match is sucked in, oxidizing conditions prevail in the chamber; if the flame is blown away from the peep hole, the correct condition obtains in the furnace.

The electric furnace offers great possibilities for brass annealing under accurately controlled conditions, both from the standpoint of temperature and of furnace atmosphere. In the electric furnace there is no contamination of the furnace atmosphere from the heat source and the atmosphere in the furnace can be definitely controlled by supplying to the furnace a gas of known composition. Such atmosphere must be maintained during the heating and cooling cycles. No burner ports, no dampers, and sealed doors make for an air tight chamber during the anneal.

When annealed electrically, with air as the gas present during the cycle, even at higher temperatures used on run down stock, practically none of the black oxide is present.

Low heat electrical anneals produce a slight sheen on the brass surface; higher anneals, a thin gray film that seems to peel readily, leaving a clean surface beneath. A chemical analysis of this gray film found on high brass shows it to be:

Volatile	4.31%
PbO_2	0.14
SiO_2	7.08
Fe_2O_3	5.77
CuO	6.42
ZnO	71.95

In other words the conditions prevailing in the electrical anneal, where air is the atmosphere in the chamber, promote principally the formation of zinc oxide and practically no cupric oxide. This is an excellent condition, both in respect to staining and disturbance of the strip surface, as well as in respect to the later reactions in the pickling medium.

The cooling of the metal after the heat offers another problem. If the coils are drawn from the furnace with a minimum of oxide thereon formed, and allowed to cool in air, enough oxide will form in a comparatively short time to completely offset the effect of a non-oxidizing condition in the furnace. The oxidation here again is a function of the temperature of the anneal and the coils when withdrawn; the low temperature anneal coils oxidizing only slightly while cooling in either air or water, the high temperature annealed coils oxidizing considerably.

Red and Brown Stains from the Anneal

Red stains caused by the annealing operation itself are rather scarce. Such stains are often formed in the furnace in the presence of oxygen when, either because of accident or design, the heat of anneal approximates the melting point of the brass. Also, the red stains occur where the flames from oil burners impinge directly upon the surface of brass. Some oils and soap solutions used as lubricants and left on the surface of bars and sheets in excessive amounts cause the formation of red stains under oxidizing conditions. In general it is safe to say that the control of air in the heating chamber is a measure of the control of the staining tendency.

Brown stains from the anneal likewise are uncommon and result mainly from the rapid drying of water and oil on the coil surface. These stains are found mostly on the inner laps of coils.

Red Stains from the Pickle

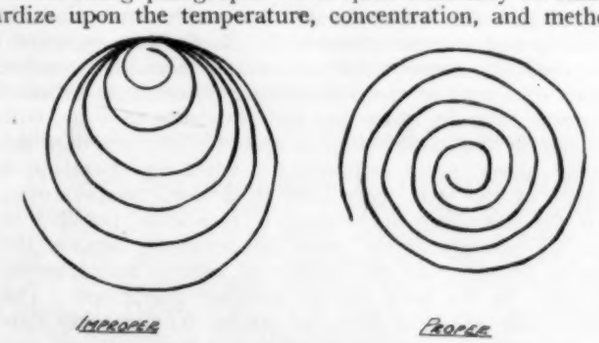
The agent commonly employed as the pickling medium in brass mills is sulphuric acid. Endeavor is made to keep the pickling tanks constantly around 6% acid concentration, but this actually varies from about 2% to 10% depending upon the frequency of refreshment.

Red stains generally result in conjunction with this type of pickle under the following conditions:

A. Hot solutions.
B. High concentrations.
C. Tight coils in the pickle.
D. Impure wash water.

Hot Solutions: The proper temperature of the common sulphuric pickle is 70 deg. F, or about room temperature. At practically all concentrations hot pickle in combination with the black oxide of copper, formed in the oxidizing anneal, will result in extremely bad red stains. Non-oxidized coils or slightly buff oxidized coils obtained from correct furnace conditions, are practically free from the menace of red stains in the case of hot pickling solutions.

High Concentrations: Occasionally the pickle tender will refresh his tank by dumping in a carboy of acid while a rack of coils is in the tank. In such an event the coils will be brought out in the red stained condition due to both the heating of the solution from the chemical action and to the great local increase in concentration. Again the degree of black oxide present determines the amount of the resultant red stain; clean bars being little affected. In pickle of no greater than 6% concentration, the red staining effect is practically nil even on the oxidized surface under favorable conditions as discussed in the following paragraph. It is quite necessary to standardize upon the temperature, concentration, and method



Showing Proper and Improper Methods of Opening Coils To Pickle

and frequency of refreshment of the pickle in the brass mill if red staining is to be reduced to a minimum.

Tight Coils in Pickle—Impure Wash Water

Probably the most common cause of red staining in respect to the pickling operation is the lack of equal access of all parts of the oxidized coil to the pickling medium. Coiled stock on racks, particularly the lighter gauges resulting in a great increase in the number of laps, is extremely hard to open uniformly and in such a way as to have no two adjacent laps in contact with one another. Now wherever laps are in contact, and their surface is covered with black oxide, there will appear, upon withdrawal from the pickle tank, a black spot ringed by several concentric irregular red stains. Sometimes a black stripe across the width of the bar with red stripes on either side, depending upon how the contact is made. Again the heavier the oxide the greater the degree of red stain around the portion of the coil in contact is the rule.

Common mill practice calls for breakdown and rundown passes and anneals without pickling. Thus at first pickling the coils are well covered with black oxide, and where the laps touch, the resultant red stain is severe and will probably persist through the balance of the processing until eliminated by such radical treatment as a strong bichromate dip. Therefore, whenever coiled stock with oxidized surface is pickled, adequate and uniform opening must be provided to prevent red staining.

Severe red stains result from pickle of any concentration drying on coils and then annealing. The red stains in this case are evident directly after the anneal, oxidizing or non-oxidizing. Any pickle drying on coils would naturally come from the wash tanks, which from lack of proper circulation or cleaning out, rapidly become weakly acid.

It is well to note that in unusual cases charcoal or wood in contact with brass during an oxidizing anneal will stain red. The fatty acids in soap lubricants stain red, as does iron in contact with brass in sulphuric pickle. Clean coils wetted will develop fantastic red and brown stains between the laps after standing some time.

Conclusions

The double-headed cause of the most prevalent red stains must thus be:

1. The oxidation of the brass surface coupled with:
2. The formation of the red stain under certain conditions in the sulphuric pickle.

Obviously the most logical step in the brass mill to decrease red staining is to regulate the pickle temperature, concentration, and method of refreshment, paying special attention to the opening of the coils from their first pickle to their final one.

The next, and more important one, is to provide proper annealing equipment to eliminate oxidation during anneal.

With proper attention to both of these factors the red stain can be practically done away with, as well as the use of expensive dips and cleaners, such as bichromate of soda solutions, whose action on the surface of the annealed sheet is doubtful as to benefit to severe drawing operations later on.

A Study of Bearing Bronze

WHILE "bronze" is, strictly speaking, a copper-tin alloy, this term now covers a multitude of copper-tin compositions containing a third or even a fourth element. Among the elements that are added, zinc and lead are perhaps the most widely used in bearing bronzes.

A study has recently been made at the Bureau of Standards of the effect of casting temperatures and of additions of iron on the properties of bearing bronze material consisting of 80 per cent copper, 10 per cent tin, and 10 per cent lead. In addition to determinations of hardness and microstructure of this leaded bronze, several test methods were employed which simulated certain phases of actual service conditions. These tests included deformation under pounding and resistance to wear, both dry and in the presence of a coolant. As bearings are usually above room temperature while in operation a number of the tests were held at elevated temperatures.

In the founding of bronzes it is seldom possible to pour all castings at the same temperature, because the metal is drawn from the furnace at various temperatures and cools in the ladle during pouring operations. The study of the effect of different casting temperatures thus aids the manufacturer in producing better castings and at the same time helps the consumer by predicting what variations in properties may be expected of bronzes cast at various temperatures. In the study of 80-10-10 bronze, cast at temperatures varying from 1,850° to 2,120° F., it was found that as the casting temperature, the grain size, and the resistance to wear were increased the hardness decreased slightly, and a slight tendency was noted for more even lead distribution. Casting the bronze at about 2,000° F. caused a decrease in the resistance to impact or lowered the toughness, as shown by the notch test. The deformation under pounding was a minimum in specimens cast between 1,900° and 2,000° F.

Although iron is not usually added intentionally to leaded bronzes, small amounts often accumulate during the process of manufacture through the use of scrapped bearings, iron stirring rods, and so forth. While the iron content is quite small in most cases, the effect of this element is generally considered harmful. In the reported investigation the iron content, which varied from 0 to 1.0 per cent, was studied to determine its effect upon bearing bronzes. In general, it was found that iron additions over 0.3 per cent were detrimental to the bronze investigated. Small additions of iron (up to 0.5 per cent) decreased the resistance to wear and increased the hardness. When the iron content exceeded 0.3 per cent, segregation of the lead particles occurred, the grain size was reduced, and a decrease was noted in the notch toughness. Additions of iron up to 1.0 per cent increased the resistance to pounding.

Testing Materials' Committee Meetings

Account of Group Meetings of Committees and Cleveland Regional Meeting. Work on Type Metals, Bearing Metals, Copper Alloys and Light Metals.

COMMITTEES of the American Society for Testing Materials held another in their series of annual Spring Group Meetings in Cleveland at the Hotel Cleveland from March 7 through 11. This series of meetings, arranged for the convenience of committee members who are interested in the activities of more than one committee, was well attended. Committee sessions took place in the morning, afternoon and evening of each day, with the exception of Wednesday evening, when the Regional Meeting Dinner was held. About 400 registered for the meetings.

In all 20 main committees of the Society took part but with the many section and subcommittee meetings necessary, the number of meetings held during the five days was upwards of 100.

Several of the committees offered new standards and there were several revisions of existing ones suggested and acted upon. There were new subcommittees formed to investigate important projects and programs of work for these and existing groups were laid out.

The following committees on non-ferrous metals held meetings:

Standards for Type Metals—Bearing Metals Being Investigated

The Subcommittee on White Metals—Tin, Lead and Zinc of Committee B-2 on Non-Ferrous Metals and Alloys at a meeting on Thursday, March 10, in Cleveland organized a subgroup to undertake the consideration of specifications for various type metals. This meeting was one of the series of A.S.T.M. group meetings of committees held in Cleveland, March 7-11. The subgroup under the chairmanship of W. A. Cowan, Assistant Chief Chemist, National Lead Company, has representatives from the Government Printing Office, and the Hearst Newspaper groups. Other consumers of type metals will be subsequently added to the committee.

As part of a general study of the properties of babbitt metal which Subcommittee IV is working on, an investigation carried out at the National Bureau of Standards, Washington, was reported. The data and information obtained in these tests which included service tests on some of the alloys, designed to supplement laboratory tests, will be reported in a paper, "Mechanical Properties of White-Metal Bearing Alloys at Different Temperatures," which is to be presented at the 1932 A.S.T.M. annual meeting in Atlantic City. Among other tests there are included determinations of wear resistance, resistance to pounding, Brinell hardness, and stress-strain relations in compression. The work which will be reported in this paper will complete certain parts of the general study of babbitt metal properties. It is hoped that other studies will be inaugurated in the near future to complete other parts of the project including a determination of correct pouring temperatures and effect of impurities on the properties of the metal. A revision of the present standard specifications covering bearing metals will probably follow as a result of data obtained in these investigations.

Officers of B-2 on Non-Ferrous Metals and Alloys are: Chairman: **William Campbell Howe,** Professor of Metallurgy, Columbia University. Secretary: **E. E. Thum,** Editor, "Metal Progress."

Committee on Copper and Copper Alloys Recommends Several Standards' Revisions

Committee B-5 on Copper and Copper Alloys at its meeting on Thursday, March 10, in Cleveland recommended revisions in standards under the jurisdiction of the committee. This meeting was part of the A.S.T.M. spring group meetings of committees held in Cleveland, March 7-11.

The Standard Specifications for Brass Pipe, Standard Sizes, are to be revised to include admiralty metal pipe and red brass pipe in addition to Muntz metal and high brass pipe now specified. Action was taken at the meeting to recommend revisions in the Standard Specifications for Sheet High Brass (B 36-27) which will include a change in the requirements for annealed sheet to include five nominal tempers defined by grain size with corresponding Rockwell hardness data which is to be given for information only.

A specification has been prepared by Committee B-5 for copper water tube covering three classes of tubing, depending on the use or application, as follows:

Class A—Designed for underground services and general purposes;
Class B—Designed for general plumbing purposes;
Class C—Designed for use with soldered fittings only.

Minor modifications in the Tentative Specifications for Copper-Base Alloys in Ingot Form for Sand Castings and in the Tentative Specifications for Sand Castings of the Alloy: Copper 80 per cent; Tin 10 per cent; Lead 10 per cent were also approved and will be recommended for adoption to the Society in June.

The present officers of the committee are **Dr. C. H. Mathewson,** Professor of Metallurgy, Yale University, Chairman, and **D. K. Crampton,** Metallurgist, Chase Brass and Copper Company, Inc., Secretary, who were reelected to these respective offices.

Light Metals Committee Forms Important New Subcommittees

At the meeting of Committee B-7 on Light Metals and Alloys in Cleveland, March 10, three new subcommittees were formed in order to better advance the work in this field. The meeting of Committee B-7 was part of the A.S.T.M. spring group meetings of committees held in Cleveland, March 7-11. The newly formed committees will be responsible for the following projects:

1. A study of proper test bars for light metals;
2. A study of the determination of the elastic properties of light metals;

3. The collection, correlation and dissemination of available engineering data on the physical and mechanical properties of light metals and alloys, and corrosion-resistance properties and protection measures.

It is very probable that, after these committees have been functioning for a short time, the work may result in a general symposium on "Light Metals and Alloys."

The increasing interest in light metals and alloys is evidenced by the repeated demands for technical data that will be of service to the designing engineer. This demand has been partially met by the standard and tentative specifications thus far adopted by the A.S.T.M. through the work of Committee B-7. Three additional specifications will be recommended to the Society for adoption and publication in the 1932 Proceedings. These are:

Tentative Specifications for Aluminum-Alloy Wire Rods and Bars;
Tentative Specifications for Magnesium-Base Alloy Sheet;
Tentative Specifications for Magnesium-Base Alloy Wrought Shapes.

Officers of B-7 on Light Metals and Alloys: Chairman: **J. B. Johnson,** Chief, Material Section, Material Division, Air Corps. Secretary: **J. A. Gann,** Metallurgist, The Dow Chemical Company.

Hot Tinning Steel

Q.—We are contemplating installation of a hot tin dipping plant for cold rolled sheet steel products. Heretofore, we have had our product tinned on contract, outside, and the results have been very unsatisfactory, due to the fact that they had to rust the items in order for the tin to adhere to the surface, which required considerable time and expense.

We would like to know what flux our items can be dipped into before going into the tin bath. In fact, we would appreciate receiving this information as well as any other as regards the preparation of sheet steel materials before going into the tin bath.

A.—There are three distinct steps in hot dip tinning any article. These are cleaning, pickling and tinning. If the sheet metal parts have been stamped or drawn, they may have oil or grease on them, or some of the drawing compound may be pressed into the surface. All traces of any oil and grease must first be removed by putting the articles through a good hot cleaning solution. The temperature of the solution should be about 200 deg. F. When all traces of grease have been removed, the articles are taken from the cleaning solution and given a boiling hot water rinse. They are then ready for pickling.

Pickling metal stampings is usually done in a solution of sulphuric acid. The strength of the acid should be about 4%, and the temperature 160 to 180 deg. F. In order to produce a good article, an inhibitor used in the pickle will be found beneficial, but care must be taken that too much inhibitor is not used as that will give too smooth a surface and the adherence of the tin coating will not be good.

After pickling, the articles are washed thoroughly in hot water, which also helps to dry them. They are immediately dipped into a liquid flux of zinc chloride, and then carefully put into the tin bath. If the articles are very small, they can perhaps be done a number at a time by hanging on racks or other equipment suitable for doing a number at once. A thin layer of zinc chloride flux should also be placed on the surface of the tin bath. A mixture of zinc chloride and a small amount of sal-ammoniac make a good flux for the tin bath.

Tin melts at 449 deg. F. A bath temperature of 475 to 500 deg. F. is usually high enough for light work. The temperature should be high enough to give a clean, smooth, bright coating and still not be so high that the metal will be overheated. When the pieces have been in the bath a sufficient time to coat them properly, they are then removed and cooled by setting the coating in a kerosene oil bath which is set in water jacket. After the oil bath they are dried in sawdust and then blown clean with an air blast.

W. G. IMHOFF.

Forming Tubes

Q.—We would like information on methods used in rolling or drawing open seam, brazed, welded as well as combination brass and steel tubes made up of plural plies of tubes. In other words, we are only interested in tubing rolled up from flat or ribbon stock in small sizes.

In addition to the above, we would like to have any records pertaining to the use of electro-deposited copper on steel or other metal and using the copper so deposited as a medium for joining or fusing together tubes or any kind of material when suitable heat is applied.

A.—The forming of tubes from flat metal strips is a long established commercial operation. In the past it was used largely in the manufacture of brazed brass, bronze and copper tubing for gas chandeliers, the old style electric fixtures, and brass bedsteads.

For bedsteads the tubes, after being brazed, were pulled over iron tubes slightly smaller in diameter, then pulled through a steel die (a draw bench operation) that fitted the outertube snugly to the inner. Steel strips were formed into small tubes, brazed and used for umbrella rods.

Later the forming machine which forms the tube and double seams it was developed.

We know of no operation that forms up two plies of different metals in one operation, preparatory to brazing or welding. This would present many mechanical and metallurgical difficulties.

The process of electro-copper-plating strips of different metals as an aid in brazing or welding is not a familiar one.

The Institute of Metals, Otis Building, 810 18th Street, Washington, D. C., may be able to furnish you with literature on this subject. A nominal sum is charged for this service.

W. J. PETTIS.

Nonferrous Metals in the Automotive Industry

By FRANCIS A. WESTBROOK
Mechanical Engineer

A Review of the Different Metals and Alloys Used in the Construction of Motor Vehicles. Large Tonnages are Consumed.*

THE use of non-ferrous metals in the automotive industry is of great interest because the rapid development of the industry has resulted in many other subsidiary developments, among them a great variety of applications of aluminum, nickel, copper, lead, etc. It is the purpose of this article to give a brief survey of the very diverse uses to which these metals have been put and, insofar as practicable, to give an idea of the quantities.

Aluminum

Decrease of weight is one of the most important considerations, not only from the standpoint of lightening the car so that it may be the more readily accelerated and brought to rest, but also with respect to the reciprocating parts of the engines which must also be stopped and started. Vibration must be reduced. Aluminum engine parts also permit of better cooling because of the greater heat conductivity.

By using the light aluminum alloys a saving in weight of the parts so made of from 40 to 60% is realized. The following are some of the parts of motor cars made of aluminum and its alloys—crank-case, clutch-housing, timing gear cover, water pump, oil pan, radiator cover, pistons, connecting rods, cylinder heads and cylinder blocks. Internal brake shoes are often made of aluminum due to the fact that the aluminum has a greater coefficient of expansion under heating than the iron drums. The heat from the application of the brakes causes the drum to expand and draw away from the shoes thus tending to impair their efficiency. But if the shoes are made of aluminum their greater expansion offsets this effect to a large extent. The fact that aluminum dissipates heat rapidly is another advantage in this application.

Tire valves are often made of aluminum and more and more aluminum hardware is being used for the reason that it is corrosion resistant. This includes the pedals, door handles, step coverings, caps for hubs and radiators, radiator shells and other parts. Of course, the saving in weight is another consideration.

For the bodies of passenger cars aluminum is used with much success, decreasing the weight and lowering the center of gravity. Sheet aluminum is used. Castings of aluminum are also used to give greater rigidity and consequently decrease rattling, although with such construction there is little or no saving in weight.

With commercial bodies very striking savings in weight have been made with the result that a corresponding increase in pay load is possible. Savings of as much as 1,500 lbs. have been made and in one case the payload has been increased over a ton, which means a much higher return toward the extra cost of the body.

In all of the cases whose aluminum is used in motor car construction it is in the form of alloys containing important percentages of copper, zinc, nickel or magnesium, other non-ferrous metals.

Copper

Copper is used in many different ways in motor cars. The total amount used in 1930, according to the American Bureau of Metal Statistics, was 86,900 tons. It is employed for the oil distribution system in the form of oil tubing in the crankcases and, of course, in the electrical installations. Copper or brass tubing is used for gasoline piping as well. Copper alloys play a most important part as bushings and bearings.

This brings us to a consideration of what may be termed the "heavy" non-ferrous parts of motor cars. This includes phosphor bronze and aluminum bronze used for worm-wheels on many cars, especially trucks, and the phosphor and lead bronzes used for bushings, bearings, etc.

Of course, copper forms the largest single element in these alloys, but other non-ferrous metals play an important part in each case.

Some typical alloys are given below:

PHOSPHOR BRONZES FOR WORM-WHEELS

Copper %	Tin %	Zinc %	Nickel %	Lead %	Phosphorus %
Remainder	11-13	1.5-2.0	See foot	.....	0. 1-0.25
Remainder	11-12	.25 mox	note	0.5-2	0.05-0.25
Remainder	10	.....		0.25 mox	0.25-0.50

Note: In some cases 2.5% replaces a like amount of copper, tin, etc., other metals remaining the same.

ALUMINUM BRONZES FOR WORM-WHEELS

Copper %	Aluminum %	Manganese %	Nickel %	Iron %
Remainder	9.5	....	4.75	5.25
Remainder	10.0	....	....	0.5
Remainder	9.0	0.5	0.5	3.5

PHOSPHOR AND LEAD BRONZES FOR BEARINGS AND BUSHINGS

	Copper %	Tin %	Lead %	Nickel %	Phosphorus %
Phosphor	Remainder	10-13	.....	.....	0. 5-1.0
Bronzes	Remainder	13-13.5	Under .25	.....	0.25-0.50
	Remainder	10-12	1.5	0.5-1.0	0.15-0.30
	Remainder	9-11	2-5	.....	0.5
	Remainder	10-12	8-10	.....	0.05-0.15
	Remainder	5- 7	12-15	0.5-7.0	.....
	Remainder	2-10	15-30	1.0	.....

These tables not only give a very fair idea of how the large amounts of copper are used in automobiles, but also of the other non-ferrous metals. To this should be added the copper forming parts of the aluminum alloys.

*Previous articles on the subject of the Uses of Metals in Transportation by the same author were published in our issues for January and February, 1932.

Nickel

In addition to the nickel used in the above mentioned bronzes and the aluminum alloys, this metal is found in several other parts. For instance, it is in nickel-steel alloys for case hardening parts and high tensile parts; for springs and for exhaust valves in combination with chromium to resist the formation of scale. Low carbon steel with 3% nickel is used for the frames.

In addition to this there is the whole field of rustless steels for chassis parts, nuts, bolts, pump spindles, bumpers and parts which it is desirable to keep bright for the sake of appearances. These steels contain 13 to 18% chromium and 7.8 to 13% nickel. Nickel, as is well known, provides the best base for chromium plating. It is also used in the steel for crankshafts, drive shafts, connecting rods, gears, etc. Carburetor needle valves are quite often made of Monel metal. In fact, there is a distinct tendency toward an increase in the applications of nickel steel. Finally, there is the apparently expanding use (although still small in quantity), of nickel-chromium and nickel molybdenum cast iron. The latter, containing 2% nickel and 1% molybdenum is unusually strong and tough, but expensive. According to the latest advices 1% nickel and 0.35 to 0.50% molybdenum is giving good results in cylinder blocks, brake drums and hard wearing parts. The addition of small amounts of chromium has been found to add to the hardness.

Nickel cast iron for brake drums has shown a marked increase during 1931, its use having been expanded from application to trucks and busses to high speed pleasure cars.

Summary

While the uses of the non-ferrous metals in this automotive industry have been treated only under the three headings of aluminum, copper and nickel, several others have been taken into account.

According to the American Bureau of Metal Statistics the use of non-ferrous metals per car, exclusive of generators and starters, averages about as follows: copper, 45-50 lbs.; lead, 6 lbs.; zinc, 20 lbs.; tin, 7 lbs.; aluminum, 12 lbs. With respect to the last figure it must be remembered that a great many cars have very little aluminum while others have a good deal so that as a result the average is low.

The total tonnages, according to the same source, in 1930 were copper 86,900; lead 11,000 excluding batteries and 160,000 including batteries; nickel 5,450.

Cleaning Aluminum Tanks

Q.—We manufacture aluminum gasolene tanks on specifications calling for cleaning with 10% sulphuric acid solutions. We keep the acid solution in a lead lined wooden tank. The aluminum tanks are immersed for 1 hour, then placed in another bath containing running water for 1 hour. After we put through about 10 aluminum tanks successfully, corrosion begins inside the subsequently immersed tanks, forming a white, powdery frosting on the aluminum. Some show black spots, etc.

After the acid immersion and the rinse in water, we dry the aluminum tanks in an oven and oil them. The tanks are welded with baffle plates inside.

Can you tell me how to overcome these difficulties? We tried a 5% hot caustic soda solution to wash the insides of the tanks after the acid dip and the water rinse, but had no success. We want a clean, bright, uncorroded surface inside the tanks.

A.—From your statement that the first ten tanks put through the dip and subsequent washing operation give you no trouble, we are inclined to believe that the effectiveness of your wash decreases as you go along. A caustic soda solution is not good with aluminum because the caustic attacks aluminum vigorously.

Instead of placing the aluminum tanks in a tank of running water, we would suggest that each tank be placed on a fixture so designed that water will enter at one end and overflow from the other, thus keeping the tank filled with moving water for 15 or 20 minutes. The water water should enter with considerable force, and the rate of flow should be relatively high. At the end of about 20 minutes the tanks should be dowsed in a tank of water which is almost at the boiling point, then thoroughly drained. If the aluminum tanks remain in the hot water long enough to become thoroughly heated they will dry almost instantly after removal, and there should be no further difficulty with corrosion. H. M. St. John.

Homogeneous Babbitt

Q.—Could you advise the best method of alloying and casting the following white metal babbitt:—lead, 77%; antimony, 15%; tin, 7%; impurities not over 0.75%.

I have tried thick molds, thin molds, water cooled molds and otherwise; have tried pouring metal at 650, 750, 700 and also lower temperature. (Above temps. are F.) I have also added 0.50% of copper.

But, to date, I find it impossible to cast the alloy, fracture same and get a homogeneous mixture of constituents. There is always some segregation; a light area and a dark one. The light area containing the high antimony and the dark area, the high lead content.

How can we get a homogeneous alloy?

A.—You should have no trouble in getting a good fracture and a homogeneous alloy from a mixture of lead 77%, antimony 15%; tin 7%. We do not know your practice in melting. However, if you will try the following method we feel that you will get the results you desire. The melting should be done in an iron pot. We assume you use such a pot.

Place the antimony in the bottom of the pot, broken up in small pieces. Place 33% of the lead on top of the antimony. When that is melted add the tin, then the balance of the lead. Stir well and boil the metal for 15 to 20 minutes by inserting a green wood pole to the bottom of the metal; or a raw potato may be used by holding it with a pair of tongs, inserted to the bottom of the metal. When the metal is well mixed by the poling process, flux with a mixture of 50 per cent soda ash and 50 per cent rosin. Pour so that a pine stick will not burn when inserted in the metal. Pour slowly and hold the ladle close to the mold.

Water cooled molds are best as the metal cools much faster and gives a better grain. For the best results, use pig lead, Cookson antimony and Straits tin. However, scrap may be used. W. J. R.

British Institute of Metals Meeting

Abstracts of Papers Read at the Twenty-Fourth Annual General Meeting, Held in London, March 9th and 10th, 1932.

THE RELATIVE CORRODIBILITIES OF FERROUS AND NON-FERROUS METALS AND ALLOYS. Part III.—Final Report. The Results of Three Years' Exposure at Southampton Docks, by J. NEWTON FRIEND.

Nearly one hundred bars of ferrous and non-ferrous metals were exposed to sea action in Southampton Docks for three years, and an account is given of seventy-two of these. The metals examined included lead, zinc, tin, aluminium, copper, nickel, and various alloys containing iron, chromium, nickel, copper and zinc. The effect of grain-size on the corrodibility of brass has been studied. The results appear to indicate that small grain is preferable to coarse. Nickel-copper alloys, particularly the 70:28 alloy, offered great resistance to corrosion. High-grade zinc and tin were slightly more attacked than the less pure metals. The effect of arsenic in copper is discussed. Tension, riveting, and cold-working did not appreciably affect the corrosion of nickel-chromium alloy steels, but in every case cracks appeared at welds. Shell faunæ did not appear to affect the corrosion of the metals appreciably while living. Dead shelly faunæ stimulated localized corrosion in alloy steels, nickel, and nickel alloys not rich in copper. The alloy steels resisted corrosion well, but previous results showing that alloy steels are subject to serious localized corrosion are confirmed.

THE PROPERTIES OF COPPER IN RELATION TO LOW STRESSES. THE EFFECT OF COLD-WORK, HEAT-TREATMENT, AND COMPOSITION. Part I.—Tensile and Compression Tests under short-time loading. By O. F. HUDSON and J. McKEOWN.

Some results of previous research carried out by the British Non-Ferrous Metals Research Association on the subject of locomotive fire-box stays and plates (J. Inst. Metals, 1929, 42) had demonstrated the marked improvement in the elastic properties of copper containing small amounts of added elements, by work-hardening followed by low-temperature heat-treatment. That work also demonstrated the beneficial addition of small amounts of some foreign elements, such as silver, tin, &c., in raising the temperature limit at which loss of elasticity and softening occurs. The present paper gives the results of further investigation, having in mind the potential wider application of copper with such improved elastic properties and resistance to permanent deformation.

Five types of copper have been studied, namely H.-C. copper; arsenical copper with and without the addition of silver (0.05-0.1 per cent.); copper containing about 0.1 per cent silver, without arsenic, and copper containing about 1 per cent tin and about 0.02 per cent silicon. Rods of these materials with known amounts of cold-work have been subjected to heat-treatment for various times at different temperatures, and tensile and compression tests have been made. Tensile tests were carried out at room temperature and at 300° C., and compression tests were made at 300° C. and also at 350° C.

The tensile tests have shown that all the materials tested possess a certain limit of proportionality due to the applied cold-work, and that this limit of proportionality can be considerably raised by suitable heat-treatment.

The amount of permanent deformation due to stresses not greatly exceeding the limit of proportionality have been measured in tension at ordinary temperatures and in compression at 300° C. and 350° C. The results have shown the superior resistance to deformation brought about by cold-work and suitable heat-treatment, and have also demonstrated the greater resistance to deformation conferred on copper, particularly at elevated temperatures, by the presence of a very small percentage of silver and also by the presence of tin and silicon.

THE PROPERTIES OF COPPER IN RELATION TO LOW STRESSES. THE EFFECT OF COLD-WORK, HEAT-TREATMENT, AND COMPOSITION. Part II.—Creep Tests at 300° C. and 350° C. of Arsenical Copper and Silver-Arsenical Copper. By H. J. TAPSELL and A. E. JOHNSON.

The paper deals with the results of creep tests on two copper alloys, the first containing 0.34 per cent arsenic only, and the second 0.31 per cent arsenic together with 0.072 per cent silver. Both alloys were tested in the soft condition, and also in the condition arising from 5 per cent cold-work followed by heat-treatment at 300° C. and 350° C. respectively. It is shown that improvement in resistance to creep at 300° C. and 350° C. is effected by the special pre-treatment of the alloys, and that the alloys containing 0.072 per cent silver are superior to the silver-free alloys.

THE THERMAL CONDUCTIVITY OF SOME NON-FERROUS ALLOYS. By Professor D. HANSON and C. E. RODGERS.

This paper describes the results of thermal conductivity tests on a series of aluminium-copper alloys, and also the effects of aluminium, nickel, iron, phosphorus, and arsenic on the thermal conductivity of copper.

INTERCRYSTALLINE CORROSION OF DURALUMIN. By A. J. SIDERY, K. G. LEWIS and H. SUTTON.

Experiments were carried out to determine the influence of overstrain in tension or in compression and of certain modifications of heat-treatment on the tendency of Duralumin to develop intercrystalline corrosion. For the purpose of evolving a reliable test which would permit the relative susceptibility of various samples of Duralumin to this form of corrosion to be estimated in a reasonable space of time several reagents were investigated. It was found that partial immersion in a N-1 solution of sodium chloride to which 1 per cent (by weight) of hydrogen chloride had been added was capable of producing intercrystalline corrosion consistently in samples of Duralumin where a propensity towards this type of corrosion existed. The effect of overstrain was examined by subjecting to this test a number of specimens of heat-treated Duralumin

sheet to which tensile test had been applied to produce various degrees of permanent elongation and a number of longitudinal strips cut from samples of heat-treated Duralumin tube which had been compressed to arbitrarily selected stresses above the elastic limit in compression. The results of the experiments indicated that overstrain in tension increased slightly the tendency towards intercrystalline penetration, but no relation was observed between this tendency and the degree of elongation. There appeared, however, to be a critical range of stress in compression, viz: 14.0-16.9 tons/in.^{2}, for the material employed in the experiments. Samples which had been compressed in this range of stress showed the greatest susceptibility. Corrosion tests were made on samples of the sheet and tube which had been heated at various temperatures in the range 470°-520° C., quenched in cold or in boiling water and aged at room temperature with a view to ascertain the influence of such modification of heat-treatment and of quenching medium on the susceptibility of the material to intercrystalline attack. It was observed that, in general, the higher the quenching temperature the smaller was the tendency of the material to develop intercrystalline corrosion, but there was, however, an increased tendency towards the pitting form of superficial corrosion under the conditions of test employed. Material quenched in boiling water showed a very much greater propensity towards intercrystalline form of corrosion than did material quenched in cold water or cold oil.

ON THE INFLUENCE OF TEMPERATURE ON THE ELASTIC BEHAVIOR OF VARIOUS WROUGHT LIGHT METAL ALLOYS, by FRANZ BOLLENRATH.

Details are given on the experimental determination of the modulus of elasticity and elastic limit of various wrought aluminium and magnesium alloys at temperatures between —190° and +180° C. The testing apparatus is described. Particular attention has been paid to the uniformity of temperature on the test length of the specimen. A description is given of the alloys tested. The results are communicated and discussed. The elastic properties are found to increase with decreasing temperature, except in the cases of two aluminium alloys with a high silicon content.

MAGNESIUM ALLOY PROTECTION BY SELENIUM AND OTHER COATING PROCESSES. By G. D. BENGOUGH and L. WHITBY.

A process has been developed for the production of films of selenium on several light magnesium alloys. These films confer considerable resistance to the corrosive action of sea-water spray. The films are normally produced by immersion for a few minutes in a bath containing selenious acid at laboratory temperature, but may also be produced by rubbing the alloy with porus material dipped in the bath. The film has the property of self-healing to a limited extent, especially when immersed in stagnant sea-water. The film is only a few thousandths of a millimetre thick, and its production does not cause any appreciable dimensional change in the alloys treated. The film forms a satisfactory base for certain types of paint, and further work on this property is proceeding.

THE AGE-HARDENING OF SOME ALUMINIUM ALLOYS OF HIGH PURITY. By MARIE L. V. GAYLER and G. D. PRESTON.

An investigation into the age-hardening of a series of alloys made with high-purity aluminium containing 4 per cent copper, to which iron, silicon, and magnesium have been added either independently or together, has confirmed the results of previous investigators. It has been shown that the addition of 0.35 per cent iron inhibits the age-hardening at room temperature of the binary copper-aluminium alloys; this effect is partly removed by the addition of 0.25 per cent silicon, and is entirely removed by the addition of 0.5 per cent magnesium. X-ray and microscopic examination have failed to give an explanation of the phenomena observed during age-hardening at room temperature.

The conclusions are drawn that (1) age-hardening of a Duralumin at room temperature and at 200° C. is due to some process, as yet undefined, which takes place prior to actual precipitation of $CuAl_2$ or Mg_2Si from the aluminium lattice; (2) in conjunction with existing equilibrium data, it is suggested that Mg_2Si as well as $CuAl_2$ plays an important part in the process of age-hardening.

SOME BRONZE SPECIMENS FROM THE ROYAL GRAVES AT UR. By C. F. ELAM.

A short account is given of the micro-structure of some bronze articles found by Mr. C. Leonard Woolley in the Royal Graves at Ur. The approximate composition has been determined and qualitative tests have been made of the corrosion products. Some of the objects had been cast; others showed signs of subsequent working and annealing.

THE "FOGGING" OF NICKEL. By W. H. J. VERNON.

A study has been made of the characteristic filming or "fogging" that occurs under suitable conditions on polished nickel surfaces. The effect is attributed mainly to the catalytic oxidation of small amounts of atmospheric sulphur dioxide; suspended sulphates play a minor part. There is a critical relative humidity, below which the metal may be exposed, apparently indefinitely, without action taking place, and above which fogging readily occurs. The process is affected by light, film formation being approximately halved when light is completely excluded. In the early stages the film contains nickel sulphate with free sulphuric acid; later, it passes into basic nickel sulphate. The formation of the primary film may be largely suppressed by pre-exposure of the metal to an atmosphere containing traces of hydrogen sulphide, which appears to act as an an anticatalyst. Fogging may also be inhibited by alloying the nickel with chromium, or by covering the surface with a film of lanoline.

THE BEHAVIOR OF SINGLE CRYSTALS OF BISMUTH SUBJECTED TO ALTERNATING TORSIONAL STRESSES. By H. J. GOUGH and H. L. COX.

Two single crystals of bismuth have been tested under alternating torsional couples with the object of studying the phenomena, particularly the slip phenomena, associated with fatigue. Throughout the tests, however, no slip bands were observed. In the early stages of the tests numerous bands were produced parallel to the twinning planes, and finally cleavage cracking occurred. The bands parallel to the twinning planes could not be definitely identified as twin bands by metallographic examination; but evidence as to this identity was finally found in the cracks observed on the surface of one of the specimens. Some signs of recrystallization were observed, the effect tending to extend along the sites of twin bands.

The production of twin bands appeared to depend on the sheer stresses on the twinning plane, and consideration is given to the theoretical reasons for this dependence. It is shown that on the basis of minimum energy there is no reason to associate any type of movement with stresses tending to cause this movement by the shortest geometrical path, and that the process of twinning may be due to stresses which at first sight appear to be incapable of affecting the process.

This article will be concluded in an early issue.—Ed.

Newark Branch Holds Annual Banquet

THE Newark Branch of the American Electroplaters' Society held its Annual Banquet and open educational session on April 2nd at the Elks' Club in Newark, N. J. The educational session took place in the afternoon and the banquet at 7 P. M. The banquet was, as usual with this branch, a highly successful gathering. Good food, good entertainment and good company combined to give the members and guests the very pleasant evening which they have learned from past experience to look forward to, in Newark.

The educational session was of unusually high order holding interest from a technical as well as a practical standpoint. The meetings were opened by Philip Sievering who acted as chairman. The first paper was delivered by **R. M. Burns** of the Bell Telephone Laboratories in Newark, on the subject of **The Electrochemistry of Corrosion.** Mr. Burns pointed out how important the problem was from an economic standpoint, as corrosion cost the United States alone at least $500,000,000 annually. Mr. Burns discussed the various methods of corrosion prevention, such as paint, chemical preparation, metallic coatings, etc. He also explained in detail the electromotive series of the varous metallic elements and the influence of this table on corrosion and corrosion prevention.

The second paper was entitled **The Use of Meta-Silicates** by **Dr. J. R. Cleveland** of the Philadelphia Quartz Company, Philadelphia, Pa. Dr. Cleveland told the meetings of the wide variety of uses for liquid silicates (water glass). Sodium meta-silicate is a general name for a material which varies in composition from $Na_2O.SiO_2.5H_2O$ to $Na_2O.4SiO_2$ water. The $Na_2O.SiO_2.5H_2O$ is a soluble, crystalline product, which, it was found, can be used in many cases for cleaning purposes.

Dr. Cleveland described the constituents and the action of commercial cleaners. He explained how to evaluate cleaners—the most important properties being their "wetting" ability and also their degree of alkalinity, which can be checked by pH determination. He went on to describe practical applications of meta-silicates as metal cleaners.

The next was a lecture by **Dr. C. L. Mantell** of Pratt Institute of Brooklyn, N. Y., on **Light Metals and Their Electrochemical Preparation.** Dr. Mantell described in vivid and entertaining style the methods of extracting from their ores the light metals (formerly rarities and laboratory curiosities) such as aluminum, magnesium, sodium, calcium and beryllium. It was a most instructive and interesting address.

Powdered Metals

The last paper on the program was one of great interest to the metal field as well as to the platers—**Powdered Metals** by **Charles Hardy** of Charles Hardy, Inc., New York. Certain metallic powders have been known for some time such as copper, bronze, etc. Recently aluminum powders have been developed for use in paints and as catalyzers. Metallic powders for paints have been, in the past generally, made by grinding, producing thereby a very fine flake. Another method which has been known for some time is the reduction of purified oxides in reducing atmospheres; for example, blue powder as produced in the zinc industry. This, however, is likely to be expensive in the cases of some metals which are hard to reduce from their oxides. A third method of obtaining powdered metals is the electrodeposition of a loose spongy deposit which can be scraped or shaken from the cathode. This method holds great possibilities but must be accurately controlled and skillfully operated.

A wide field of usefulness has been opened to powdered metals. In addition to their old and well-known function in paints and as metallic coatings, they are being used now for reconsolidation into useful shapes. They can be used in pure form, that is as single metals, or they can be mixed in the proper proportions and thereby form a synthetic alloy. The powder is pressed together under very high pressures, up to 250,000 pounds per square inch, and then heat treated, (sintering) after which the product can be even further solidified by forging, swaging, etc. The metal must be in the purest possible form to be treated successfully. Oxides must be absent. Among the metal powders which have been successfully produced and used to date are copper, zinc, aluminum, chromium, nickel, silicon, tin, molybdenum, tungsten and various combinations of the above to form a wide variety of alloys.

Certain details in the methods of manufacture are of great interest. After the powder has been produced it is carefully dried and then classified by screening, dividing it into groups varying from 100 to 500 mesh. It can then be placed in the proper dies and made up into commercial shapes. Alloys can be formed; also composite metals such as a layer of nickel over a layer of iron; also mixtures with non-metallic substances, such as oilless bearings, which contain 90 parts copper, 10 parts tin and 1 to 4 parts graphite. Specific gravities of the pressed materials vary from 1/3 to 4/5 of the theoretical specific gravities.

Among the advantages obtained by the use of pressed metals are the following:

1. It is possible to make alloys which are difficult if not impossible to mix in the molten condition; such for example as combinations of metals with very high and very low melting points or of wide differences in specific gravities.

2. It is possible to make mixtures with non-metallics such as carbon and graphite, thus producing oilless and self-lubricating bearings.

3. Manufacturing losses are very small in comparison with those encountered in other processes. Wastes caused by oxidation, spillage, burning, and excess metal required for gates, risers, flashings, etc., are eliminated. The process of making pressed parts from metal powders is subject to close mechanical control at ordinary temperatures.

4. Parts made of powdered metals are selling at competitive prices in comparison with similar parts made by the usual manufacturing methods.

As an example of the usefulness of reconsolidated powdered metallic parts, Mr. Hardy cited the fact that the new Chrysler automobile is now using 87 parts made in this fashion. Oilless bearings made of pressed powdered metals have been adopted for many makes of small motors and electric fans.

Progress Report on Exposure Tests of Plated Coatings

By P. C. STRAUSSER

What Is Being Done at the Bureau of Standards on the Research Program on 7,000 Specimens

A PAPER READ AT ROCHESTER CONVENTION OF THE AMERICAN ELECTROPLATERS' SOCIETY IN 1931 AND PUBLISHED IN THE MONTHLY REVIEW FOR FEBRUARY, 1932.

MOST of you who are members know at this time of the plans launched by the Research Committee, of the investigation that is being carried on at the present time at the Bureau of Standards. Non-members who are present at this assembly and who are representing manufacturing concerns engaged in the handling of metals, especially in the finishing of such metals, are equally interested in this project as we are, both morally and financially. I will endeavor to give you a few of the details involved on this research program being conducted at the present time.

The purpose of the test, **first,** is to learn the relative protective value of the various plated coatings; **second,** to learn the value of laboratory tests, and for specifying the quality of such coatings. Our efforts are being concentrated at the present time on the plating of steel, although this investigation will cover other base metals, such as brass, aluminum, and zinc, although we are reserving that to some later date, if conditions permit.

The General Plan

There are about 7,000 specimens to be plated at the Bureau of Standards under specified and carefully controlled conditions, and of course under the careful supervision of Dr. Blum. These plated specimens will be exposed at five points throughout the country, namely, Sandy Hook, New York City, Pittsburgh, Pennsylvania State College, Bureau of Standards, of course, and Key West. An inspection of these plates will be made periodically by a joint committee of the American Electro-Platers Society and the American Society for Testing Materials. Laboratory tests will be made on duplicate samples.

Some may wonder just when the inspection of these plates is supposed to be started. We will at the Bureau of Standards make very close inspection of our own racks, and when we see the first indications of breakdown, we will immediately notify the Inspection Committee to go out in the field and make their inspection.

The Financial Support

The researches outlined at the present time will cost in the neighborhood of $10,000. Of this, the Bureau of Standards is furnishing about $4,000 in salaries and traveling costs; the American Electro-Platers Society about $4,000 in salary and traveling costs of the Research Associate; the American Society for Testing Materials, about $1,000 for racks, which will be used for mounting the specimens in the field, and manufacturers have contributed about $1,000 worth of anodes, steel and plating chemicals.

Dr. Blum outlined in detail some months ago, the conditions which we will use at the Bureau of Standards in plating these specimens. This was presented before the American Electro-Platers Society and representatives of the American Society for Testing Materials, in Chicago, January 16, which outline was approved after making slight modifications.

The Work

The base metal, which I said before, will be steel in the form of cold rolled strip, .032" in thickness. The size of the specimens to be plated is 4 x 6 inches, or 10 x 15 centimeters. In other words, it will comprise an area per plate of one square foot. These will be plated on racks. One rack will carry six plates, two racks being used per plating cycle. In order to hold that plate in a rack, we are cutting a strip off one corner, a quarter of an inch wide, over to a certain distance, and then turning this strip back upon itself, forming a sort of flap. That will be tied in on the rack by means of a nut and bolt and a washer.

Finishes

First, nickel deposits will represent about thirty variations. That means to say we will use alternate layers of nickel, copper, nickel, or copper, nickel, plus chromium, and so forth. That is, the thickness of deposits of nickel will vary from 2½ to 25 microms, or .0002 to .002 of an inch. These nickel plates will also be plated under deposition conditions and combinations as stated before.

Chromium Plate. About forty kinds of chromium will be used, including the same variations as nickel, and also variations in chromium, such as the different chromic acid/sulphate ratios, temperature and current conditions. Dr. Blum's paper has a very close bearing on this particular project. We will use all these variables.

Zinc Plating. There will be about twenty kinds of zinc, including the acid and cyanide baths, various thicknesses and current densities.

Cadmium. About ten kinds will be used.

Zinc-Cadmium Alloys. About five kinds, which will make a total of about 110 variations.

Now, five samples, representing each variation, are to be exposed at each location. In other words, there will be approximately 600 plates at each point of location, comprising a number, as I said before, of about 7,000 plates.

These specimens will be mounted in such a manner that no part of the plated specimen will be in contact with any of the metal, by the use of porcelain insulators.

These tests will include stripping, porosity and accelerated corrosion. In the laboratory tests, we want to find out which laboratory test is best for us to determine quickly what to expect from this particular plate in the field, in service.

The Present Status of the Program

Additional tanks and equipment have been installed at the Bureau. They did quite a bit of revamping down there, new tanks were purchased, everything had to be hooked up, and most of you know what it means, the many details before you get started. So that was our job several months ago. About 500 of the 7,000 specimens have been prepared. The plant is being operated from 6:00 a. m. to 6:00 p. m., so government hours don't mean a thing to us. We are doing this in order to make maximum use of the equipment available. Barring unforseen circumstances, we expect to have the 7,000 plates ready for the field by November 1 of this year. I have here a plate all set, ready for the field. After the plate has been finished, we snip off this flap, and we spot that point where of course the green metal is exposed to the atmosphere, if it were not protected by some means, and also we spot the stencil marks. Of course it is to be assumed that this point will break down sooner than the rest of the plate; that is, we expect that. But in order to overocme that point, we applied a special enamel, an air-dried enamel, for that purpose.

I don't know whether you realize the amount of work involved in plating these specimens. At least I didn't when I first went down to Washington. I thought it was going to be a one-man job. At the present time, it keeps three of us hustling from 6:00 a. m. to 6:00 p. m., as I said before. We have one man come in at 6:00, another man at 10:30, and we have a third man during the day, so you can rest assured we are doing our best to get this out as fast as we can, because we want to get some information on what's what.

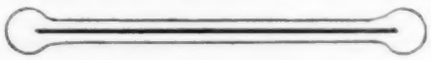
Discussion

Dr. Blum: A lot of steel was made especially for us at one heat of steel very carefully finished so as to get a uniform finish. It is not quite as high a polish as might be produced by polishing steel with good conditions, but on the other hand, it is more uniform than we would get if we or even others more expert than we, tried, to polish 7,000 of these specimens. So we are taking this just as it comes to us. It is greased to protect it from rusting.

Another point that I think might be of interest is the shape of the racks used for plating these specimens, because that has a great deal to do with the uniformity of the specimens. It is no criticism of the previous tests that have been made on the plated coatings to say that there was not, in most cases, enough information regarding the uniformity of the specimens.

You simply have a rack made of 1" strip steel, and this with a suitable hanger above. The specimens are held in position, six in each rack, so that there is a uniform spacing of a quarter of an inch all around each specimen. And this rack is not insulated, because we want it to serve as a thief. In other words, these six plates with that metal rack, are as nearly as possible, one large piece of metal, with the slight difference that we leave this quarter of an inch between the plates so that the coating will be a little thicker at the edges than the center, because we don't want the edges to fail first. That is a condition that is very hard to measure. Now, by simply manipulating the conditions, the size of this rack and the depth of solution, and the position of the anodes, just by guess and try, we have gotten this so that we can weigh these twelve plates (we plate two of these racks in a tank at once) and we can weigh those twelve plates the first run. Every set of conditions on a set of twelve weighed plates, and those must agree within plus or minus 2%, before we go ahead and plate the rest of them. It means if there are 500 specimens of a certain kind plated, they will have the same total weight of metal on each specimen within plus or minus 2%. You will agree with me, that is better than you can hope to do under commercial conditions, but we want this to be uniform.

We have also examined the cross-section of the specimens, and if you imagine that that is greatly magnified, we get a condition like the illustration.



Magnification of Cross Section of Specimen.

Say we have a thousandth of an inch of nickel on here, we will have out here on the border about 50% more.

We mention those things because that took a lot of care and trouble to work out the details, but we believe it will be worth while. If, for example, you plate five or five hundred specimens under otherwise perfectly good plating conditions on a rack, you may find that 10% of them will be a whole lot heavier than the rest, when you put them out in the field. It might be that out of five specimens you have one heavy one and four light ones; you try to draw your conclusions, and you don't know. Or in another case, you might have one light one and four heavy ones. In this case, we are trying to make this as uniform as possible.

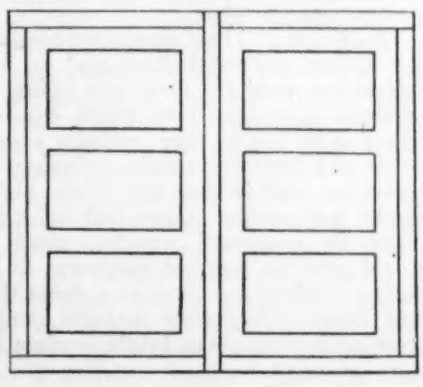
And the last thing, before any plate is wrapped up to be preserved for the test, it is inspected. That means if there is a physical defect, it is thrown out. We don't want to know what defective steel does, but we want to know what otherwise good plate will do under ordinary exposure conditions, so we are going to many details that might not be apparent.

F. J. Hanlon: What preparation is being made to investigate these plates again before the exposure tests are made? Isn't it possible that there might be a variation in the corrosion test on those that have been plated now and those plated two or three months later?

Dr. Blum: While that is a possibility, we are guarding against it by very careful conditions of storage. These plates, as soon as they are polished, are cleaned with carbon tetrachloride to remove the grease, and then spotted so as to cover the number and the bare spots so

SPECIMEN RACK

Six pieces hung in each rack.



that those places will not corrode first. Then they are inspected and wrapped, first in sheet filter paper in groups of five, and then in heavy waxed paper, to be put in storage until such time as we are ready to take them in the field. So that, humanly speaking, we believe those are perfectly protected from corrosion until such time as we are ready to put them out.

MR. HANLON: The reason I asked the question, we had an experience of that character, and by the time we got the job completed, the stuff we plated first showed signs of checking.

DR. BLUM: I think that that is a very important thing to look into. Of course, there is this fortunate thing, that all the plates of one kind will be made at once. For example, if we have 600 of No. 13 to make, we will run those 600 right away. We make just about 100 to 120 a day; just get through about ten racks a day in our twelve hours, and that will depend, of course, on the length of time of plating. But we have got to average over 100 plates a day to get these 7,000 done before November.

I am going to give you a little experience to show you that we are learning a lot out of this thing. By the time we are through, we really hope to know something about plating. We had worked with a typical nickel solution, nickel sulphide, chloric acid, etc. We had used that for job plating for months, and did our preliminary work, and everything in that, and thought we were already to start. We wanted to start off fresh and clean, so we dumped everything out, cleaned the tank perfectly, made a new solution, purified it, removed all the copper, zinc, and iron and everything from it, and started in plating, and we had the most beautiful bunch of pits you ever saw. If we had tried to make sieves, we couldn't have done any better. We simply tried different things two or three days and so on, and finally came to the expedient which we know a lot of platers are using, and which we tried to avoid because we wanted to introduce no new variables if we could help it. But we put a little bit of hydrogen peroxide in. The pitting stopped, and that was three weeks ago, and 500 plates have gone through there without a single pit of any kind, showing that it was not the hydrogen peroxide, but it was some impurity in the solution which was taken out or destroyed by the hydrogen peroxide. Since then, we haven't had to use any. But I am telling you that to show you we are not running all easy pie there.

J. CAIRNS: I would like to ask Dr. Blum what dip you put them into before the nickel.

DR. BLUM: What we call our standard cycle of cleaning is this. These are coated with grease, so first we remove most of the grease with carbon tetrachloride. Then we run them in an electrolytic cleaner, rinse, and then run in an acid pickle, sulphuric acid pickle, for about two minutes, and rinse and go right into the nickel.

MR. BROWN: I would like to ask how the buffing is taken care of in these various coatings—how you avoid cutting through the edges, or getting different thicknesses over the plate.

DR. BLUM: There again, we have tried to standardize the buffing and the buffers, and we have got some very interesting results. There are going to be a lot of by-products from this work which will be very interesting. There is no use of very carefully weighing up the specimens and getting exactly a thousandth of an inch of nickel on, and having one fellow buff off half a thousandth and another fellow buff off a ten-thousandth, because the specimens wouldn't mean anything. So we would give six weighed specimens to the men doing the buffing. There are three men doing that. We had them buff them. They were nickeled, and they just buffed them until they got a bright surface there. They were using the same wheels and the same composition, and we were surprised to find out how uniform the results were; that is, the losses in weight. This is on buffing one side, because we are only buffing one side. The losses in weight were from fifteen hundredths to thirty-five hundredths of a gram on each specimen, and with an average of very close to twenty-five hundredths of a gram. Now, that twenty-five hundredths of a gram represents about 3% of the total weight of nickel, but since it is on one side, we have really cut off 6% of the nickel. So, in making our calculations for weight, we have allowed 10%. In other words, we have allowed one ten-thousandth of an inch of nickel for buffing there. Now, that isn't exactly uniform, because when we have the quarter thousandth plates, they are thinner and come out smoother, and it doesn't take out quite as much in buffing. So we have to guess and try. In other words, when we make a quarter thousandth plate on the first run we find out how much we take off in buffing, and calculate how much we have to allow for buffing, and run it so many minutes. For example, a one thousandth plate under certain conditions, represented seventy-five minutes' plating. That was an hour and a quarter. Well, then, a half thousandth doesn't represent just a half of that, because we have to allow for buffing on both of them, and we have to allow more in a half thousandth than we do with a thousandth. Then, when we come to the edges and so forth, there is the chance of cutting through. But since they are thicker there, we are protected against that.

And then there is this other precaution we are taking. I don't know what you think of this specimen passed around, but we are not trying to do fine buffing. I mean by that, we want to do uniform buffing. So that I tell the fellows, "If you do see a little dull spot or a little scratch in there, don't buff until you get it all out, because by the time you do, you'll get all the nickel or half of it off." So we would much rather put out a sample having a very little scratch that isn't taken out in the buffing than we would just to buff out that scratch and then as a result not know how much nickel we had on there.

J. CAIRNS: Dr. Blum, I would like you to give us more explanation on this pickle you use, and why you keep them in there two minutes.

DR. BLUM: If we are putting on light coats of nickel, we don't need it. We can, with just a dip in acid, put on a quarter or half thousandth of nickel, and it will stand up in bending and anything else. But put on two thousandth of an inch of nickel on a perfectly polished steel surface, and without a slight etching of the metal, such as you get in a two-minute pickle, we simply say that it is difficult. We don't say it is impossible, but it is difficult to get anything that will stand all kinds of bending tests afterwards in the ordinary treatment. So that, simply as a standard treatment, we are using about two minutes' acid pickle. It is just barely enough—you can't see the etching of the surface. But we know there is a slight etching.

MR. CAIRNS: What is the density of that pickle?

DR. BLUM: About 10% by weight of acid. It is 2 normal acid.

MR. BURROUGHS: What proportion of acid do you use? Are there any advantages of sulphuric over muriatic acid?

DR. BLUM: There is no necessary advantage there. We debated there about using sulphuric or muriatic, hydrochloric, acid. One, purely a matter of convenience, is that we can keep the sulphuric acid in a lead tank and use it at any time we want to, whereas with the hydrochloric acid we would have to use a stoneware tank. It is purely a matter of convenience.

Polishing vs. Plating Standards

By ERNEST LAMOUREUX

Formerly Chicago District Sales Manager,
Hanson-Van Winkle-Munning Company

Full Consideration Must Be Given to the Proper Preparation of Work Before Plating. Most of the Polishing Should Be Done on the Base Metal, Not on the Plate.

IN my article presented at the Annual Educational Session of the Los Angeles Branch A.E.S. on March 14, 1931, and published in the May, 1931, issue of the "Platers' Review"* under the title of "What Constitutes a Good Base for a Standard Electroplate," it was my aim to bring to the attention of the Research Committee of the American Electroplaters' Society, and the plating industry in general, that, insofar as steel and iron products are concerned, where a high lustre finish is the rule, the present procedure in the efforts to arrive at a standard of plate which is expected to endure was based upon a wrong idea; in other words, unless we get at the fundamentals of the problem the solution of it is impossible.

Unless the men who are being supported, at least in part, by the American Electroplaters' Society, and others among manufacturing plants, give consideration to that phase of a good plate which is the basis of the whole problem—perfect polishing—all efforts to improve the standard of plate upon steel and iron products will be of no avail, because that is the root of the entire problem.

In the February issue of the "Platers' Review" there is a report, together with considerable discussion, upon the samples for exposure tests. About 7,000 specimens are being plated or have been plated, and are to be exposed at five different points selected for their variety of elemental effects upon these samples. It is not my purpose to question or criticize this work, but I am interested and feel that the entire plating industry ought to be interested in that part of these samples which are finished with a high lustre, that is to say, with a buffed finish and the methods employed in the production of these samples. If the base of these samples has not been prepared any differently than that which has prevailed in manufacturing plants in recent years (I refer here to the polishing conditions), I fear that we will not know very much more after the tests are completed than we do now.

The discussion did not bring out any information as to the preparation of the surface of these samples before plating. In my opinion this is the paramount feature of the samples, if we are to expect something better than the general level of durability in plated coatings of recent years. Unless the samples of steel and iron carry a vastly higher grade of polishing on their surfaces before plating than has been the practice generally in manufacturing plants in recent years, obviously they will not stand up any better than any other products of a similar nature.

Another point along these lines was brought out in the discussion, namely, the buffing of the samples, and a loss by weight was noted resulting from the buffing operation. This loss cannot be uniform over the entire surface of the articles. In most cases the nickel would be cut off more in some spots than in others. Hence, the only safe way to provide samples of the kind for the series of tests in question, would be to have them perfectly polished first, so that the subsequent buffing after plating would only consist of a coloring operation. In that case there would be almost no loss of metal.

It would seem also that manufacturing plants might have been invited to submit samples of their products to be exposed to the same series of tests, for the purpose of comparison of results of samples produced under practical conditions as against those from the laboratory. My reason for pointing this out is the fact that (as shown by the discussion) the methods used at the Bureau for the production of their samples differs from regular shop practice in a lot of plants. In this connection I want to cite one example. In the cleaning cycle as shown on page 23 it is stated that a sulphuric acid pickle was used and the time of the immersion was two minutes. Why a pickle on work which has been polished? And why two minutes? According to shop practice this should be a dip in a 50-50 solution of water and acid, preferably muriatic acid, and the immersion, almost instantaneous.

What Are the Objects of the Research

Other questions are these. What is the aim of the exposure tests of these samples? What standard is it expected to meet? Is it the presumption that the results of these tests will enable us to arrive at a standard of plate that can be guaranteed for life, or a standard that can be expressed in terms of years? Is it expected to stand up under the elements of wear and tear to which it is exposed? How can we establish a standard if we have no concrete idea as to what the standard is to be?

If we take the automotive industry for an example, does this industry know what standard is necessary on the plated part of their product? If so, why has it not found it and how can anyone else produce it unless there is knowledge of what it is? Obviously no standard of plate on that part of their product which is made from steel and iron, can be guaranteed for life. How many years do they expect the plating to endure? If that can be ascertained it would be easier to supply the answer to their problem and, of course, the same is true of other industries where similar finishes are in use.

With reference to the automotive industry and others in the same category, which deals with the finishing of steel and iron with nickel, copper, nickel, and chromium plating for beauty and durability, any research on such products to improve their lasting quality that does not take into account the quality of the polishing prior to plating, is wasted energy because unless the surface of any such articles is properly prepared first, the plating will not endure.

* "The Monthly Review" of the American Electroplaters' Society.

The Right Time for Polishing Is Before Plating

I desire to quote here from my article published in the May, 1931, issue of the "Platers' Review" to bring out further what I mean by the art of really good polishing.

"All of us are familiar with a highly buffed piece of brass or copper, and also the fact that such a piece of work, when nickel plated, can be buffed on a relatively small buff to obtain a very high lustre. Therefore, any piece of steel or iron should be polished to such fine finish and high lustre before being plated, to enable you to buff the article after plating exactly the same as is the case with brass or copper. That is what constitutes a really good job of polishing."

Most of those who agreed that my article of May, 1931, was correct, assume that manufacturing concerns will not consider improving the standard of the polishing on account of the added cost. How can anyone assume that there will be any added cost? True, the cost of the actual polishing would be increased, but the final cost of the work completely finished may not be more than the present cost, because savings could be effected in cleaning; also in buffs and buffing compositions.

Years ago, before the development of present day plating facilities, all steel and iron products were beautifully polished. In fact, in those days, polishing was considered more important than plating. We plated the work a certain length of time; we had absolutely no means of measuring current, and neither did we know the contents of plating solutions. Yet we rarely heard of our work rusting. The polishers were compelled to deliver their work to the plating room free from blemishes or scratches. It had to be a mirror finish and free from grease from the polishing wheels. As a result, cleaning was a very simple process. Besides only one buffer was required for buffing the work of from 6 to 8 polishers, depending upon the nature of the work, whereas in this day and age of plating, it is not uncommon to find as many buffers employed as there are polishers, in many plants.

Due to poor polishing where work is copper plated and buffed before being nickel plated, much of the work is cut through the copper, trying to bring up a lustre finish on the articles. What good is the copper if it is on only in spots? If the work were properly polished first, buffing the copper deposit would become merely a coloring operation, all the copper deposited would remain on the surface of the work, and would have a real value.

Correct Polishing Procedure

Really good polishing is not so difficult as some might imagine, if it is approached in the right way. It consists of the use of proper types of wheels, suitable abrasives, speeds, etc., for the particular work in hand. Then it is necessary to remove entirely the cut of the previous wheel, and the only sure way of doing this is to cross the cut of each of the preceding wheels in the process of roughing and finishing; at least two grease wheels and a final coloring wheel operation. This may vary and in some cases require six wheels, but in any case the work finally must have a scratchless and mirror finish when delivered to the plating room.

No polishing wheel should be over 12 inches in diameter. It is more easily kept in balance, and infinitely easier on the equipment. No canvas or cloth wheel was ever intended to be used as a greasing or finishing wheel in polishing. Its purpose is only for roughing and fining. Leather wheels are better for greasing and final finishing.

I have studied the work of Professor Edwin M. Baker in his investigation of polishing by microscopic measurement of the depth of a cut by various grades of abrasives. While that may be interesting, it impresses me as wasted energy, because if a definite system of polishing is laid down for any class of work, and the system is carried out to the letter, it is not necessary to measure the cut of any wheel in order to accomplish a perfect job.

My experience in making surveys of polishing rooms over a period of years justifies the opinion that the poorest jobs of polishing in the industry have been done on bumper bars. And yet under the ideas suggested above, perfect polishing on this class of work can be accomplished just as easily as upon any other class of work. To illustrate my point, let us assume a cycle of polishing operations for bumper bars as follows:

No. 46 abrasive on canvas wheels.
No. 120 abrasive on canvas wheels.
No. 120 abrasive on bullneck leather wheels.
No. 180 abrasive on bullneck leather wheels.
No. 200 abrasive on bullneck leather wheels.
No. 200 abrasive on bullneck leather wheels.

The sequence of the wheels shows six operations. The first three leather wheels are intended as grease wheels; the last wheel is the same as the fifth and has been worked down to be used for the final color operation. Now in connection with the working down of this wheel to obtain the correct results, it would be necessary for the polishers to resort to finding suitable stones. We may still have a few polishers who will know what that is, but the so-called polisher of today has no knowledge of it, or its purpose. In the days of really good polishing, all polishers carried a polishing stone which they prized as much as any other possession they might have.

These stones were selected for their hardness and surface from most any stone pile, and a flat surface was worked down on this stone by grinding it on solid emery wheels. This stone was then used on the surface of the final grease wheel, and coloring wheel, to lay down the grain of the abrasive on the wheel so that it would not scratch the work they were finishing. It would be borne in mind in this connection, that this also cleaned the surface of the wheel, so that the final operation was dry, leaving the surface of the work clean, and thus greatly simplified cleaning in the plating room.

It may be interesting to point out that we produced perfect polished work years ago with only two grades of emery, namely, 46 and 120. This was accomplished by removing completely the cut of the No. 46 wheel with the subsequent No. 120 as a fining wheel, and then following by No. 120 grease in three greasing operations, by which time the No. 120 wheel was worked down to such a fine face that we performed a coloring operation with a surface like a mirror. It should be noted here that when a polisher started greasing at that time, he finished his job from then on without changing wheels. Therefore, perfect polishing is not so much a matter of the best selection of abrasive grains, but rather the perfect performance in each operation in any polishing cycle, so long as the abrasive is a good grade. It really makes no difference how carefully grains may be selected or how many numbers that may be used. If the operations in a polishing cycle are not correct, the resulting work will not be good.

Polishing Is the Weak Spot of the Plating Industry

My experience in surveys of plating rooms confirms me in the opinion that in the majority of cases little improvement could be made in plating equipment and general facilities for plating; also that regarding the deposition of metal, whether nickel or copper, the nature of the metal deposited could not be improved upon. If the products have not endured long enough to satisfy the users of the products turned out, the fault has not been in the plating, but rather in a lack of finishing before plating.

In my opinion all research activities into a more durable coating on steel or iron which does not take into account proper polishing first is a waste of time and money. It would be just as reasonable to assume to cure any cancerous growth without removing the root.

Taking the Pressure Out of Depression

By CHARLES W. HARDY
Frank J. Quigan, Inc., Brooklyn, N. Y.

A Thoroughly Practical, "Hard Boiled" Article on How to Reduce Costs, Based on Experience as Applied Successfully by Manufacturers and Jobbing Shops.

IF you have all the surplus cash necessary to maintain your business, if you can get cash loans sufficiently large, or if your business is profitable, this is ideal and no change should be contemplated from present policies. If not so fortunate, you may get some help from this article.

Lowering Direct Labor Wages

In many cases this may have to be done. How much to reduce and the way to do it with the least friction, still maintaining the employees' interest, is a problem that should be carefully thought through and planned. The method used by most concerns is to decide on the amount and then post a notice in the factory. This is not nearly as effective as to call in a few at a time and describe conditions to them, or get them all together and explain.

Are You Paying Labor on a Time Basis?

Do you have to? If not, change to piece work. In his industry the writer has found regular straight piece work to be most efficient. Further, it is easy to install and is readily understood by those receiving compensation. It is obvious by this method that you pay for the number of pieces made and efficient employees are paid accordingly. Your production is sold by the count. Under this plan you are paying wages based on good work produced and not on employees' talk or foreman's praise for certain "very good" operators. Just recently a small manufacturing concern in Brooklyn saved over 60 per cent in a single department, by changing from a time basis to piece work; besides which, the management claims that the quality of the work is better.

Lower Indirect Labor Wages

This may have to be done, too, but it is better to have a talk with the foremen. This should be done by the management, and should be handled in a diplomatic but straight-from-the-shoulder method. The employees should be told facts. The writer has found that when this is handled in the right way all logical thinking employees will agree with the management, provided, however, that the facts are stated clearly and in a manner easy to understand.

Should Employees Be Laid Off?

You may probably have to do so in order to balance your organization. This is a matter where sound judgment must be displayed and careful consideration given.

A method used is to arrange for certain employees to take two or three days out of each week. Conditions must be considered, and when you first start to arrange for the lay-off you will find yourself making reasons why you cannot lay some of these employees off either definitely or indefinitely. Forget about the excuses and take action. If you get "pinched" in trying it, you can get the employees back.

Lower Rent

Your first thought concerning this expense is that nothing can be done. First you find that you are on a lease, and you know the landlord will not consider a reduction. Forget about these conditions and go about the problem with the idea that something must be done. Consult your landlord, put the facts squarely to him, and with the proper argument you should get one month's rent out of the year as a concession, or its equivalent in the form of a monthly reduction, thus saving over 8 per cent. The landlord may have all kinds of reasons why he cannot reduce the rent, but they do not help you. Don't let him insist that if any change or concession is made, it will automatically break the lease. This can easily be overcome by drawing a separate agreement to act as a supplement to the lease.

Compensation Insurance

This can be reduced, but results take time. Get acquainted with the State Rating Board, get a schedule of how your rate is arrived at, and see where you can save. These schedules, to the layman, are quite complicated, but with the help of a good broker or an insurance company's representative you will understand the major factors that go to make up your final adjusted rate. Then, in a very short time you can find just what items you are being penalized for that can be readily remedied. Most manufacturing concerns understand very little about compensation insurance, and due to their neglect they are paying much more for this expense factor than they should. A great deal of this trouble is due to the fact that the broker who carries the insurance is quite friendly with the management (in many cases a relative) and the matter is left entirely to him. The broker, not being a manufacturer, does not understand factory conditions, and naturally does not insist on certain changes being made where worth-while savings could be gained.*

*The story of how Mr. Hardy reduced the compensation insurance rates at the plant with which he is connected is to be found in "Making a Safety Record in a Metal Working Plant," METAL INDUSTRY, February, 1930, pp. 77-80.—ED.

Should Operating Hours Per Week Be Changed?

Not unless absolutely necessary. There are many good sound arguments that could be presented, but it is not necessary to go into details. First, this is costly, and small manufacturers with efficient and smooth deliveries should not attempt to change, during this "hand-to-mouth" buying period, simply because of the probability of losing good customers. The customers want immediate deliveries, more so today than ever before. If the factory is closed two or three days a week this is impossible, and therefore you are unable to render prompt service. Further, the closing down of the plant has a very bad psychological effect. It is an indication that you are "slipping." Keep operating on the same schedule with less employees, is the writer's solution to this problem.

Decrease Spoilage—Bad Work—Customers' Complaints

An easy, practical way to get better co-operation, to eliminate customers' complaints, reduce spoilage, better you work, know your employees' thoughts, in still interest, keep your organization "on its toes," etc., is to have a meeting in the office once a week of the main employees (those in charge); this meeting to be held on the same night each week. Start right after the closing hour—forget about supper until after the meeting. You are meeting to think, not to eat.

Get right down to business and start on something definite. Example: "Why did it take so long to start shipping Jones and Smith's order?" Then, after the various alibis, proceed with the next question. "John Doe complained about the finish of the parts shipped yesterday. Should this have happened?" Next, "What caused so much spoilage?" "Why does it take so long to assemble No. 109 parts?" Let those responsible fight it out. It will help. Those attending will find ways and means of overcoming and avoiding trouble, and this will tend to prevent a recurrence. They will make suggestions concerning the work of others, and this generally makes two fighting factions start co-operating, which is the result you wish to attain. The time you spend at the meetings will start repaying immediately and you will be surprised at the quick results. Remember the **you** in this case means the owner or the "Big Boss." He must be at each meeting, ask questions, settle the disputes, offer suggestions to overcome troubles, etc.

Purchasing

Here is the part of any business that can get you into real trouble. Consider carefully these factors:

Quantity Needed. Generally a guess—most times too much. Buy less and order more often. Deliveries are quicker today than ever before.

Do You Really Need? Be sure before you order anything that you have nothing on hand that you can substitute, especially when ordering items of raw materials. Many large concerns are guilty of this costly procedure due to their complicated systems not functioning so well. In the small concerns usually a lack of system and trusting too much to memory is responsible. Good judgment coupled with a willingness to try a small quantity of some item of raw material on hand will often prove very profitable.

Right Price. There are few today who know (I'm not one of the few) that you must fight for the right price. Concessions, rebates, etc., are a few ways that prices are not maintained. We don't know whether it is the buyers' or sellers' fault. Therefore, I offer this suggestion: Think you are paying more than you should and keep on fighting until you reach rock bottom.

Terms of Settlement: Vendors will tell you: "Our terms are standard and we insist that they be maintained." Believe it or not, you can buy from many large concerns today, take the usual cash discount and pay the bills on the 10th or 15th of the following month. Would you be willing to grant this basis of settlement to your customers if they all paid on the 10th or 15th of the following month? Surely you would and so will most of your vendors. Try it and be surprised.

Savings in Packing, Shipping, Power, Heat and Light

These expense factors generally present possibilities of savings. Too much is taken for granted by owners and managers. Make a careful analysis of these items. If you do, you will find ways and means of reducing. There are so many variables involved that space does not permit being specific.

Generally this expense does not get good, sound thought. Getting the order together usually entails too much unnecessary handling ("playing checkers"), packing, counting, recounting and repacking. Can you use corrugated containers instead of wooden cases or shooks? Boys make deliveries. Do they overlap? Is carfare checked? Does the truckman charge the right rates; or if you have your own truck does he need the two or one helper? Does the truckman dovetail deliveries with pick-ups? Watch and control the overtime in this department. How do you check postage on parcel posts? Do you send too much via special handling, if shipments are F.O.B.? Do you always send via parcel post when it is cheaper than express?

How About Your Selling?

Prices. Are you using the correct method of knowing what your selling price should be. Assuming that you are, should you accept orders at cost to carry your overhead? Yes, in **some** cases it should be done. But first, is the account good? Do they generally pay on time? Is the order of fair size? Have you any necessary raw material on hand? And most important of all, just how much overhead will the order absorb? If the cost does not contain at least one-third of overhead it is dangerous. The above applies to manufacturing concerns. For the jobbing shop I will not attempt to say, as the proposition depends entirely on the existing conditions, and besides very few know their actual costs. Overhead expenses are guessed at and are generally wrong, either much too low or very high.

Customers. Do almost anything to retain or obtain a good customer; get and hold all his business in your line. If you must give a concession or rebate arrange to do it. It certainly is not good business principle, but neither is the Volstead Act, and that is something that for the time being we just can't help.

Example. The automobile and radio industries are quite large and well organized, you will agree. They have one price and maintain it, until you start getting the "allowance" on the used car or radio. You know that different allowances are made by various agencies for the same car or set, and this certainly results in differences in the net selling price.

The method may be called allowance, concession, rebate, etc. It is legal and customary practice; is being done every day; and customers want it. If you must do it to get the business—**Get the Business.**

Metals and Metal Working Equipment In New and Interesting Applications

"Pull" Rolling Mill

A NOVEL type of rolling mill is the "Pull Mill" shown here. The machine is a four-high mill, but it operates with idle rolls, there being no pinion stand and gear drive. The metal strip is pulled through the rolls by means of "blocks" on each side of the roll. When the end of a strip is reached, the pull is reversed for further rolling. The machine was adapted from mills used in manufacture of shim steel, and it is said to be particularly good for producing radiator stock and similar materials. This type of machine has been tried out in one or two nonferrous rolling plants, although the preference is still for the familiar types of sheet rolling equipment.

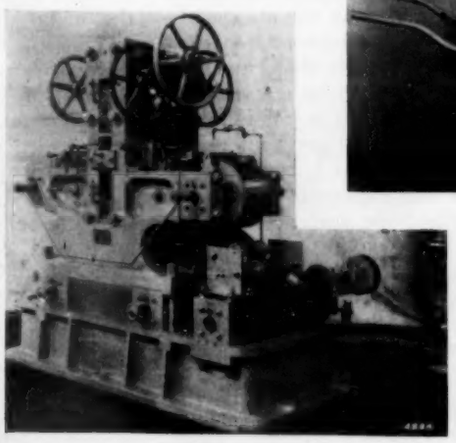
W. J. PETTIS.

Aluminum Wheelbarrows

THE light weight wheelbarrow shown here is a product of the Cleveland Wheelbarrow and Manufacturing Company, Bedford, Ohio. It is constructed entirely of aluminum, with the exception of the axle, and weighs but 37 pounds—less than half the weight of the usual carriers of similar size.

It has a sheet metal tray, blanked out of 14-gage aluminum sheet, formed and beaded in the usual manner. The handles are tubing; the braces, aluminum channel sections. Heavy plate is used for the wheel disc, while the tire is fabricated from quarter inch bar. Roller bearings in the wheel facilitate its movement. High strength aluminum alloys were used throughout. High resistance to atmospheric corrosion and to the corrosive influence of construction materials commonly hauled in wheelbarrows should prove to be a distinct asset.

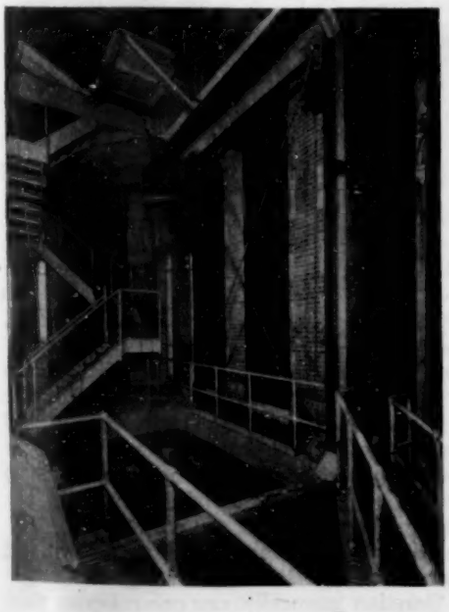
At Right—Light Wheelbarrow Made of Aluminum



At Left—"Pull" Rolling Mill Which Has Been Tried Out in Nonferrous Rolling Plants

Bronze Protects Carillon

SIXTY bronze rolling doors, or shutters, protect the carillon bells of the new Riverside Church in New York from the effects of weather. It was found that in winter rain or snow would cause ice to form on the bells and prevent their ringing. Bronze shutters were put in the tower openings after the church was constructed. They keep out the weather and make for increased fire protection as well. Cornell Iron Works, Long Island City, N. Y., installed the doors. It took 40,000 pounds of bronze to fabricate the shutters, which are of slat construction and roll up when the belfry is in use.



At Left—Interior of Riverside Church Tower, Showing Bronze Shutters Used to Protect Carillon Bells

An electric resistance furnace using rhodium wire as the heating element is being developed at the Institute of Technology of Berlin, by Ilja Westermann, who describes the new furnace in the March 11 issue of "Metallwirtschaft."

The new furnace, equipped with a rhodium resistance wire of 0.6 mm. diameter, operated at 14.5 amps. and 35 volts. The results obtained showed that a temperature of above 1,700 deg. C. could safely be obtained.

EDITORIALS

The Common Sense of Taxes

THE most prominent element in the discussion of taxes in Congress, the daily press and on the street has been the same in all of these places—loose talk. We have been besieged by phrases, phrases and phrases: "Soak the Rich"; "Tax All the People"; "Save Billions by Cutting Out Government Waste"; and so on **ad nauseam.**

What are the facts? In order to determine just what can be saved and how much money is necessary, let us look over the budget for the Federal Government, which is given below in round figures.

1.	Debt—principal and interest	$1,000,000,000
2.	Veterans' relief, pensions, etc.	1,000,000,000
3.	Army and Navy	700,000,000
4.	Administration (Congress, courts, executive department, bureaus, post office, civil service)	400,000,000
5.	Public works (public health, agriculture, education, merchant marine, public buildings and construction)...	1,000,000,000
6.	Miscellaneous (tax refunds; administration of District of Columbia)....	250,000,000
	Total	$4,350,000,000

Let us see where savings can be made. In Item 1, it is obvious that nothing can be eliminated as these expenditures have been definitely set by law. Interest payment must be made on Liberty bonds and the debt must be amortized regularly. In Item 2 we have given our national word to care for the disabled veterans. It is possible that by trimming and the closest economy, 10 per cent might be saved, (about $100,000,000). In Item 3, every Army and Navy man will insist that the expenditures for his department have been cut to the bone and that further reduction will cripple the service, leaving us helpless. However, let us allow for a 10 per cent cut (a saving of $40,000,000). In Item 4 it might be possible to save 10 or even 20 per cent but it is obvious that we cannot save billions in this department because we are not spending billions. Many of the items are fixed by law such as civil pensions, court salaries, etc. However, let us fix the maximum possible saving at 20 per cent ($80,000,000). In Item 5, we have undertaken a large number of public works with the idea of alleviating unemployment and giving business a start upward. Nobody in his right mind would consider dropping the whole program as this would aggravate our already unhappy unemployment condition. So let us allow for a 20-per cent reduction, if that can really be reached, and we have a saving of $200,000,000.

Item 6 is inconsiderable in its total. The tax refunds are not under the control of Congress, being fought out in the courts, and the District of Columbia is a comparatively small matter.

The total savings listed above amount to about $450,000,000, bringing the total expenditures to something below $4,000,000,000.

As a matter of fact the Government expenses for the coming year will be cut under $4,000,000,000 which allows for all of the savings listed above. But the receipts will be far below that figure—perhaps $1,000,000,000 less. This deficit must be raised. The budget must be balanced. How it is balanced is of very small importance compared to the principle that the Government must meet its expenses and pay its bills. If the temper of Congress and the people as a whole are against the sales tax (and many manufacturers are also against such taxes), well and good. Let us not have a general sales tax. But we must have other taxes in that case, to provide the necessary funds.

Once for all let us face the facts as Americans rather than as northerners or southerners or westerners or automobile manufacturers or importers or exporters. Our Government must spend as little as possible within the limits of efficient operation, but it must be provided with the necessary income to operate as a Government. At this time there is only one fact that has any meaning. We must provide funds through the payments of additional taxes and every one of us must pay his share.

Fair Names for Metals

AT the last meeting of the National Association of Waste Material Dealers, a plan was presented to them by Thomas A. Wright, (who is well known to readers of THE METAL INDUSTRY through his annual summary of the secondary metal industry) outlining a program to make the Association an effective body, not only commercially, but technically and industrially. Mr. Wright presented a detailed plan for the organization of the metal division with committees assigned to definite groups of subjects and sub-committees under them to make careful long-time plans, arrange for the free exchange of information, to undertake research into the numerous metallurgical, mechanical and commercial problems which exist in the field of scrap metal reclamation, and also to plan for the industry as a whole, recognizing that it is no longer restricted to hard buying and high pressure selling as it was thirty years ago, but that it is a huge and complicated, highly technical industry. We wish to add our approval to the considerable number which Mr. Wright received at the meeting, from some of the most prominent metal dealers and ingot makers in the country.

We should like to suggest that one of the problems for the Association to undertake is that of proper nomenclature for its products. This suggestion is not wholly new, the need for such action having been evident, as proved by the discussions in meetings of the A. I. M. E. and the A. S. T. M. The problem is, however, becoming more and more pressing. We are confronted by the fact that the old definitions are no longer satisfactory. At one time the term "virgin copper" was synonymous with electrolytic or Lake because of the very high purity of these products — 99.99+ per cent. Secondary metal was of comparatively low purity, running about 99 to 99½ pure. But now conditions have changed. The electrolytic refineries are taking in huge quantities of scrap copper putting them through their remelting furnaces together with blister, refining them electrolytically and turning out a product which is truly electrolytic copper. In other words the source of the raw materials has no longer any bearing upon the quality of the output. The product is electrolytic copper.

In addition to this complication we have the known fact that for many purposes ingots of the 99.5 grade (sometimes known as "casting copper") are every bit as good

Editorial Contents on Advertising Page 4

for foundry purposes as electrolytic copper. As a matter of fact it is often recommended that the "new" or virgin metal be remelted once before being poured into castings, thus making it, for practical purposes, the equivalent of secondary copper.

We offer in the form of a suggestion, the following nomenclature.

1. 99.99+ per cent—Electrolytic or Grade 1 copper.
2. 99.50+ per cent—Primary or Grade 2 copper.
3. Under 99.50%—Secondary or Grade 3 copper.

The above designations will standardize the purchases of metal upon the factor of quality alone, removing the undeserved odium which has, by custom, been attached to ingots made from scrap.

The Non-Ferrous Ingot Metal Institute, in co-operation with the Testing Material Society has done a commendable piece of work in standardizing the list of brass foundry alloys of copper base upon 20 mixtures. We should like to enlist their aid, in co-operation perhaps with the A. I. M. E., the A. S. T. M., and the Waste Material Dealers, in clarifying the nomenclature of the various grades of copper.

Oxygen Free Copper

SEVERAL years ago Professor C. R. Hayward of the Massachusetts Institute of Technology urged copper metallurgists to work to produce a purer copper which would be oxygen free. He predicted that such a copper would have new and improved properties. Now, in a surprisingly short time we are informed of the commercial production of such copper. The United States Metal Refining Company at Carteret, N. J., has been successful in producing copper, practically oxygen free.

Copper refining is an old art, still to a large extent dependent upon the skill of the operator. Electrolytic refining can be controlled to a high degree by technical methods, but in the subsequent remelting into commercial shapes, impurities creep in. The proper balancing of these impurities, the control of oxygen to the proper amount to neutralize the effects of other impurities has been a matter for the furnace operator to manage by getting his copper to the tough pitch point and holding it there. The production of oxygen free copper has been accomplished by keeping out the impurities, thus making it possible to reduce oxygen, as it is no longer necessary. These impurities are kept out by casting in vertical water-cooled molds, thereby protecting the metal from oxidation. Precise control of temperature, pouring speed and the other factors are indispensable. In other words, the product is made possible by meticulous attention to detail rather than by a revolutionary change in method.

We look forward with great interest to the results of the use of oxygen free copper, the improvements which it will effect and the wider fields and markets open to it.

Metal Coating

IN going over the field of metal coating, the covering of metals with other metallic and non-metallic substances, we are struck with the large variety of materials, methods and processes which have come into widespread use in the past generation. To list the most important of them, we have, aside from the steel heat treatment processes, such as carburizing, case hardening, etc., the following metallic coatings: electroplating of a large number of metals onto almost any base; hot zinc coating; hot tinning; hot lead dipping; sherardizing; calorizing; metal spraying; the use of duplex metals such as Alclad, Niclad and Sheffield plate; the anodic treatment and coloring of aluminum.

So much for metals. Of the non-metallic types of coatings we have rubber coating by electroplating, Parkerizing and other types of rust-proofing, vitreous enameling, lacquering, japanning and Robertson bonding.

We have the powdered metal applications such as aluminum bronze, aluminum, copper, and in the last few years, a variety of new metals used in powdered form.

All of these methods, processes and products have come in response to the first unconscious, then conscious urge best expressed in the slogan "Save the Surface and You Save All." They are bulwarks against the common enemies, corrosion and abrasion.

Theoretically, the perfect material is a solid metal, non-corrosive in character and uniform throughout. In practice this has not worked perfectly. Such alloys have been consistently expensive. Moreover, further acquaintance with their properties has revealed some of their defects; for example, inter-granular corrosion, resulting in deleterious effects, from tarnish to decrepitation.

Under practical conditions, most of the time, the best results have been achieved by a cheap, easily workable base metal covered with a thin coat of highly resistant material, serving as the protector. Much remains to be known about the methods of application and the effects of such combinations. They have increased so rapidly in number in recent years that the possible combinations have far outstripped the facilities for exploring them. Because we know so much more now than we did twenty years ago, and because we have so many new materials at hand, we have many times more to learn before we can claim to have mastered the many metal coating and finishing processes. It is not really one problem. It is dozens of problems that will call for the co-operation of chemists, designing engineers, metallurgists and last, but far from least, electroplaters, to solve and resolve.

How to Weather the Depression

WE all know the proverb "God helps them who help themselves." In times like these when most of us are too busy keeping our own chins above water to spare much energy for others, the old proverb applies with greater force than ever.

This philosophy is clearly set forth in the article published on page 155 of this issue by Charles Hardy, "Taking the Pressure Out of Depression." The principle which is bluntly set forth is—Look After No. 1.

The remedies suggested are seemingly brutal; cut wages, lay off help, force lower rents and lower insurance rates. On the other hand operations must be kept up and service to customers should remain at a high level. **Hold customers at all costs.** This may be bad business in principle but it must be done under present circumstances. Keep up and improve the standards of work; decrease spoilage; watch operating costs; purchase as little as possible and as cheaply as possible; cut out the waste in power consumption, heat, light and shipping expenses; be sure that costs are accurately known and prices are correct. And again, get the business and hold it no matter what it costs.

Many of the above suggestions are fundamentally correct. Many of them are absolutely wrong in theory and their general application would make business impossible to carry on by industry as a whole. We are, however, confronted with a condition, as Cleveland once said, and not a theory. When all industry is cutting, an individual cannot possibly stand out against it. Operating on the plan of individualism we must forgive the individual for almost anything he does. He is fighting for life.

But is it forgivable for us as a nation? Would it not be better for us to co-operate to the profit of all, manufacturers, labor and consumers alike, rather than to cut each other's throat?

Correspondence and Discussion

Casting Aluminum Around Steel

Editor, METAL INDUSTRY:

With reference to Shop Problem 5,075, regarding the matter of castings on cores of higher melting point metals. We have found that in the case of aluminum sprayed on steel tubes, the cast metal (aluminum) can be poured around it very satisfactorily.

This method is in use today in the manufacture of refrigerator evaporators, aluminum fins being used for thermal conduction, and a steel core to withstand high gas pressures.

This method would be adaptable for other combinations of metals also. However best results will be obtained from metals which have a tendency to diffuse with the base metal.

The spray process permits use of same metal in initial coat on steel core, as is afterwards cast around it, eliminating difficulty due to differences in melting points as in tinning.

NATIONAL SPRAY FUSE COMPANY.
C. E. Heil, Manager.

Cleveland, Ohio.

Pink Gold Plate

Editor, METAL INDUSTRY:

We notice in your "Shop Problems" No. 5,079, the question "Can you tell me how to produce a pink gold plate? I have calls to plate eyeglass frames in such a color." The answer printed is, "We can give you no information on how to make a pink gold solution, as this is the first time that we have ever heard of it."

It might be interesting to you to know that we have worked out solutions for plating pink gold for one of our clients in the optical goods business, and that they have been using such solutions for some time.

WEISBERG & GREENWALD.

New York City.

New Books

Pricing for Profit. By W. L. Churchill. Published by Macmillan Company, New York. Size 5½ x 8½; 271 pages. Price $3.00.

This book is described as a guide to profitable business; profitable to stockholders, managers, employees and customers. The author, a prominent consulting management engineer has derived certain economic principles from his many years of practice, which he explains in his book. They cover the whole range of management: costs, prices and policies, advertising, selling and profit requirements.

Some of the principles laid down and developed in the book will bear repetition: "Every Transaction Must Be Profitable to All Concerned—Producers, Vendors, Workers and Customers"; "Profit Must Equal the Value of Service Rendered"; "Continuously Effective Selling Is the Secret of Success"; "An Outstanding Need of Business Management is a Correct and Universally Applicable Formula for Pricing"; "The Right Price for Worthy and Needed Products and Services Can Be Obtained when the Right Price is Known"; "Mark-up Ratios are Inequitable, Fallacious and Dangerous."

The book bears the stamp of authority. The writer is an experienced and trained specialist. A thorough reading of this book is recommended to every business executive, especially in times like these.

The Patent Law for Chemists. By Joseph Rossman. Published by the Inventors' Publishing Company, Size 6 x 8½; 304 pages. Price $3.50.

Dr. Rossman, who is a patent examiner in the United States Patent Office, is known to readers of METAL INDUSTRY by his articles reviewing patents in various fields of electroplating, such as cadmium, rhodium, anodic oxidation, etc. He has given, in non-technical language, a comprehensive discussion of chemical patents. The book has as its purpose to tell the chemist what to do when he makes an invention, how to safeguard his rights legally, what procedure to follow, what precautions to take, how to prepare and file his application, how letters patents are finally secured and then how to dispose of, or disburse the commercial patent rights.

The book contains an annotated bibliography, a glossary of terms, giving definitions for the layman, and a few representative cases to illustrate its points.

Punches, Dies and Tools for Manufacturing in Presses. By Joseph W. Woodworth. Published by Norman W. Henley Publishing Company. Size 5½ x 8½; 538 pages. Price $5.00.

This is a new and enlarged edition of an old, well known practical work. It might be called an encyclopedia of die making, punch press work, die sinking sheet metal work, special tools, sub-presses, forming, piercing, drawing and assembling sheet metal parts.

Special chapters are devoted to articles of particular interest, among which are the following: the making of cartridge shells; the manufacture of pens, pins and needles; jewelry and eyeglass die making; spoon and fork making dies; watch and clock work.

This edition, it is stated, is an entirely new work, the last edition having been completely revised.

Technical Papers

Methods of High Temperature Treatment, by Paul P. Cioffi, Bell Telephone Laboratories, 463 West Street, New York. Monograph B-623. A description of methods for treating metals, chiefly iron and its alloys, at temperatures up to 1700° C., and pressures ranging from 10^{10} to 20 atmospheres.

A Method for Determining the Volume Changes Occurring in Metals During Casting, by C. M. Saeger, Jr., and E. J. Ash, Bureau of Standards. Research Paper 399, Department of Commerce, Washington, D. C. Available from Superintendent of Documents for 10 cents.

This paper reviews methods which have been proposed and used for determining the various types of shrinkage undergone by a cooing metal.

Some Physical Properties of Wiping Solders, by D. A. McLean, R. L. Peek, Jr., and E. E. Schumacher, Bell Telephone Laboratories, 463 West Street, New York.

A discussion of certain measurements of plasticity and related properties of several alloys.

Thermal Expansion of Heat-Resisting Alloys: Nickel Chromium, Iron-Chromium and Nickel Chromium-Iron Alloys, by Peter Hidnert, Bureau of Standards, Washington, D. C. Research Paper 388, available from Superintendent of Documents for 25 cents.

This paper gives data on the linear thermal expansion of various heat-resisting alloys (nickel-chromium, iron-chromium, and nickel-chromium-iron alloys). The alloys contain 0 to 77 per cent nickel, 5 to 27 per cent chromium, and 0 to 82 per cent iron.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Brass, Copper, Cadmium

Q.—I am sending you samples of two brass solutions, a cyanide copper solution and a cadmium solution. Will you please analyze these and recommend as to altering condition if necessary?—L. V. H.

A.—Analysis of cyanide copper:

Metallic copper	2.77 oz.
Free cyanide	0.16 oz.

The low free cyanide content is the cause of your trouble. If the solution is operated at 110° F., add 0.6 ounce of sodium cyanide to each gallon of solution. If operated at room temperature, add 1 ounce of sodium cyanide to each gallon of solution.

Analysis of brass solution No. 1:

Metallic copper	1.20 oz.
Metallic zinc	0.46 oz.
Free cyanide	0.44 oz.

The cause of the red deposit is due to the low free cyanide content. Add to each gallon of solution 0.6 ounce of sodium cyanide and operate solution at 80° F.

Brass solution No. 2:

Metallic copper	0.52 oz.
Metallic zinc	0.16 oz.
Free cyanide	0.25 oz.

Solution is in very poor condition. Add to each gallon of solution 3 ounces copper cyanide, 1 ounce zinc cyanide, and 6 ounces sodium cyanide.

Cadmium solution:

Metallic cadmium	2.09 oz.
Free cyanide	0.44 oz.

Add to each gallon of solution 4 ounces sodium cyanide.

O. J. S., Problem 5,082.

Cadmium

Q.—We manufacture a window screen hanger, which we cadmium plate. We have been having our troubles in holding a bright finish. When they come from the plating tank they are nearly as bright as nickel, but they soon turn dull and dead, and we are wondering what we can do to overcome this.

We use a No. 15 high carbon steel wire, copper coated, over which we put the cadmium plate.

A.—To protect the cadmium plated work from tarnishing, we would suggest the work be lacquered. A special type of lacquer must be used to obtain proper adhesion to the cadmium plated surface, and for this class of lacquer we would suggest that you get in touch with the lacquer manufacturers who advertise in METAL INDUSTRY.

O. J. S., Problem 5,083.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all blanks if possible.

Date .....

Name and address: .....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.: .....**Cathode surface, sq. ft.:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:** .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

Casting Aluminum Plates

Q.—Am working on plate in aluminum; dimensions are 7½ inches length by 4½ inches in width and ⅛ inch thick. Am having trouble in running them. Am using old scrap aluminum. Could you give any information on any alloy or flux that would liven the metal enough to run them, or do you know of any mixture that would take care of same?

A.—We suggest that you add to your scrap aluminum two per cent silicon. This will help your metal run more freely. This is best added in the form of an alloy of 50 silicon and 50 aluminum, which can be had from the smelter. If not, they will advise where you can get it. Or better still, use the S. A. E. No. 35 aluminum mixture, which consists of the following:

Aluminum, minimum	92.50%
Copper, maximum	0.60
Iron, maximum	1.00
Silicon	4.50 to 5.50
Zinc, maximum	0.20
Manganese, maximum	0.20

It can be made by making your mixture of 94% aluminum and 6% refined silicon. Melt 50% of the aluminum and all the silicon. Then add the balance of the aluminum. You can, however, buy the ingot from the smelter already mixed.

This alloy is intended for automobile body parts and other parts that must be cast in thin sections. The alloy withstands salt water corrosion very well.

W. J. R., Problem 5,084.

Bronze Finish

Q.—We are forwarding two bronze plaques. If possible, please explain how the finish is produced on these plaques. As far as we know, it is produced by first coloring then applying some solution containing permanganate of potash saturated in sawdust. This is sprinkled on the plate then washed off.

A.—The small plaque has been finished by sandblasting, plating in an acid copper solution, and then coloring in a barium sulphide solution. The coloring solution is made of yellow barium sulphide 1 ounce and water 1 gallon, and is used at 180° F.

After the bronze color is applied, scratchbrush to even the color. The green color is produced from a solution made from the following chemicals and applied with a sponge or by moistening sawdust with it and covering the plaque with the moistened sawdust:

Copper nitrate	1 lb.
Ammonium chloride	4 oz.
Acetic acid	1 qt.
Water	1 gallon

The color on the large plaque has been produced by copper plating in an acid copper solution, and then coloring in a solution made of the following chemicals:

Yellow sulphide barium	2 oz.
Ammonium hydroxide	8 oz.
Water	1 gallon

This is used at 180° F.

The finish is evened by scratchbrushing. It is then lacquered. The mottled effect on the sample is caused by "spotting out," which is characteristic of the sulphide finishes.

O. J. S., Problem 5,085.

Casting Fluxes

Q.—We have been using in manufacturing knives a metal composed of copper 65.5, zinc 16, nickel 18, lead 0.5. We have been troubled a great deal with small blow-holes, or holes caused by impurities in the metal. When these defects occur it spoils the knives and forks, and we are obliged to solder these small holes in order to salvage.

Is there some flux or substance that may be put into the metal so that it will flow in the mould smoothly and save much of this labor required to repair our goods?

A.—One of the fluxes that is used on such metals is ¼% aluminum. This has a tendency of quieting and allowing the metal to run more freely. However, it has a tendency to dross when the gating is not properly arranged. If, however, this is taken care of, good results are obtained. Another flux that is used and is said to add the quality of eliminating injurious gases as it has degasifying action upon all nickel base alloys, is called nickel silver degasifyer.

We have also heard recommended the use of about 1 ounce magnesium to 100 pounds of metal. We know that this practice is common in the higher nickel alloys.

W. J. R., Problem 5,086.

Nickel on Aluminum

Q.—I have been plating aluminum castings in my regular nickel solution just long enough to cover them before plating them in black nickel. In plating polished iron or steel in this same regular nickel solution, the product comes out very smooth and bright, like a nickel having cadmium or some brightener in it, but it flakes and peels off.

Would the plating of the aluminum do this? If so, how can this be overcome?

Also, what effect does cyanide have in a regular nickel solution?

A.—We doubt very much if the plating of the aluminum in the nickel solution is the cause of your trouble. It may be that you have carried into the nickel solution some other substance from the cleaning of the aluminum previous to the plating operation. Send us a sample of the solution for analysis and we will advise you further.

If an excess of cyanide is introduced into the nickel solution it will raise the pH of the solution and cause a dark deposit.

O. J. S., Problem 5,087.

Salt Water Gold

Q.—I have a salt water gold solution, based on the formula in Plater's Guide Book. First I boiled the solution in 5 gallons for one hour, then later in one gallon for one hour, but the result is the same. I clean and dissolve the gold myself.

I find that the solution turns green instead of brown. I have also tried stock solution, but result is same.

I use white metal, and after plating and lacquering the article is covered with green spots and pits.

A.—The green color of your solution leads me to believe that you have not put enough chemicals in the solution. Suggest that you add to each gallon of the solution 16 ounces of yellow prussiate of potash, 8 ounces of sodium phosphate, and 4 ounces of sodium carbonate. After this addition, boil the solution for an hour or so, and if good results are not obtained, add ¼ ounce of sodium cyanide.

It is not practical to gold plate directly upon the white metal. Either brass plate or copper plate, and then brass plate before gold plating.

O. J. S., Problem 5,088.

Silver Plating

Q.—Please explain the following:

We have a new rheostat for our 90-gallon silver tank. The rheostat has 53 amperes capacity. If we apply the required amperage the voltage goes up to 4 or 5. So we plate the full tank only on 3 to 4 amperes, instead of 30 (providing we have in the tank 5 to 6 dozen knives and after all we have no trouble in getting a very good result. How would you explain this?

We are sending a sample of our solution.

A.—If you are only able to use three or four amperes when silver plating five dozen knives there is something wrong somewhere. It may be due to the rheostat and it may be due to the solution.

Analysis of silver solution:

Metallic silver	0.90 oz.
Free cyanide	1.32 oz.
Carbonates	2.07 oz.

This solution is in a very poor operating condition. We would suggest that you add to each gallon of solution 3 ounces of silver cyanide and 5½ ounces of sodium cyanide. After these additions are made, if you are unable to obtain over three or four amperes for five to six dozen knives, then there is something wrong with your electrical equipment.

O. J. S., Problem 5,089.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,839,913. January 5, 1932. **Bronzing Machine.** Frank R. Belluche, Racine, Wis.

In a bronzing machine, work carrying means, means for driving said means to carry the work through the machine, means for depositing bronzing material onto the work, cleaning means for removing excess bronzing material from the work, an exhauster, an exhauster drive, and means for driving the cleaning means from the exhauster drive independently of the drive for the work carrying means.

1,839,931. January 5, 1932. **Plating.** Joseph N. Reppen, South Bend, Ind., assignor to Bendix Brake Company, South Bend, Ind.

That method of plating metallic articles which comprises immersing the articles in a bath containing nineteen ounces of potassium cyanide, seven ounces cadmium oxide, three ounces zinc oxide, two ounces caustic soda and two ounces ammonium chloride per gallon of water and plating with an anode containing zinc and cadmium in the proportions of seventy-five per cent cadmium and twenty-five per cent zinc.

1,840,429. January 12, 1932. **Apparatus for Cleaning and Polishing Metal Ware.** Harold Ernest Beckett, London, England.

Apparatus for cleaning and polishing metal ware comprising a container, a closure for said container, means for rotating said container, a liquid within said container, balls immersed in said liquid, projections upon the inner surfaces of said container adapted to prevent the goods from impacting upon balls interposed between them and said surfaces.

1,840,562. January 12, 1932. **Method of Heat-Treating Aluminum and Articles Thereby.** Ralph W. Bridges, Freeport, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

The method of heat-treating aluminum, comprising heating it in a fused bath of sodium nitrate containing about one-half of one per cent of potassium dichromate in an amount sufficient to substantially inhibit heat-treating corrosion.

1,840,708. January 12, 1932. **Process of Detinning Aluminum.** Walter Fraenkel, Frankfort-on-the-Main, Germany, assignor to American Lurgi Corporation, New York, N. Y.

A process of separating tin from a mixture containing aluminum and tin which comprises treating the said mixture in a molten condition with a metal of the group consisting of lead, cadmium and bismuth to which an alkali metal has been added. 1,840,708, Jan. 12, 1932.

1,840,921. January 12, 1932. **Bronze for Welding.** Harry L. Spence, Richmond, Va., assignor to H. L. Spence Company, a Corporation of Virginia.

As an article of manufacture, a welding rod for use as an electrode in electrically welding a bronze to steel, cast steel, cast iron, malleable iron and like ferrous metals, consisting of copper 80 to 96 per cent, silicon not less than 1 per cent and not exceeding 10 per cent, and manganese not less than 1 per cent and not exceeding 5 per cent.

1,841,038. January 12, 1932. **Machine for Plating Articles in Mass.** George L. Kelley and Carolus L. Eksergian, Philadelphia, Pa., assignors to Budd Wheel Company, Philadelphia, Pa.

A machine for plating articles in mass comprising a tank containing a plating bath, an endless belt conveyor submerged in said bath, and a measuring device for articles in mass measuring said articles in rank formation and delivering said ranks transversely of said conveyor.

1,841,396. January 19, 1932. **Extrusion Apparatus.** William A. Benz, Parnassus, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

In an extrusion apparatus, pressure applying means and a mandrel cooperating therewith; the said mandrel being provided with a part-turn connecting means whereby it may be detachably secured to the said pressure applying means and rendered semi-floating with respect thereto.

1,841,599. January 19, 1932. **Method of Treating Nonferrous Metals.** Ben F. Hardesty, Pittsburgh, Pa., assignor to Refined Steel Products Company, Pittsburgh, Pa., Corporation of Delaware.

A composition containing an oxybarium compound adapted to be admixed with a non-ferrous metal bath, said composition having the property of melting at the temperature of the bath and of combining with and removing metallic oxides present as impurities and including an ingredient having the property of disseminating said composition throughout the bath.

1,841,787. January 19, 1932. **Sanding and Polishing Machine.** Ray L. Carter, Phoenix, N. Y., assignor to The Stanley Works, New Britain, Conn., a Corporation of Connecticut.

A portable abrading machine including an elongated frame, a pair of spaced parallel runners pivoted to the rear end of the frame to sustain the weight of the machine and enable the forward end of the frame to be moved vertically, pulleys and an abrading belt driven thereby disposed in the frame, means to drive said pulleys so that the lower run of the belt moves forwardly, compression means to move the pulleys away from each other to tension the belt, cam means to move said pulleys towards each other to enable the belt to be removed, and means movable transversely of the frame to adjust one end of one of the pulleys to establish parallelism of the axes of said pulleys.

1,841,881. January 19, 1932. **Machine for Casting Storage Battery Plates.** Jasper N. Davis, Denver, Colo.

A continuous casting machine comprising: two vertical endless series of traveling molds adapted to contact with each other on their downwardly moving sides; means for feeding molten metal between said contacting molds adjacent the upper extremity of said series, said means comprising: mold plates contacting with the sides of said molds adjacent their contacting faces; and a conductor through said mold plates for admitting molten metal so that it will flow horizontally into said contacting molds.

1,841,978. January 19, 1932. **Tin Plating.** Floyd F. Oplinger, Perth Amboy, N. J., assignor, by mesne assignments, to The Roessler & Hasslacher Chemical Company, a Corporation of Delaware.

A process for the electrodeposition of metallic tin, comprising conducting an electrolyzing current from a tin anode to the article to be coated as a cathode through an aqueous solution of sodium stannate and sodium hydroxide whose composition is limited by a sodium hydroxide normality which increases at a uniform rate from 0.7 when the stannate normality is 1, to 1.34 when the stannate normality is 2.6, the range of sodium hydroxide normality at each normality of stannate being 0.1 less to 0.1 more than the values thus defined.

1,842,085. January 19, 1932. **Rust Proofing Composition and Method of Making the Same.** Matthew Green and Elmer M. Jones, Detroit, Mich., assignors to Parker Rust-Proof Company, Detroit, Mich.

The process of forming a rust-proofing compound which comprises stirring iron fragments while slowly adding thereto an approximately 65% solution of phosphoric acid until the amount of solution added is substantially in the proportion of two quarts to one pound 2.29 ounces of the iron used, thereafter stirring in manganese dioxide in substantially the proportion of 4.96 oz. to the pound of iron, and finally stirring in manferine to an amount substantially equal to 5.84 oz. for each pound of iron.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Automatic Polishing and Buffing Equipment

Hammond Machinery Builders, Inc., Kalamazoo, Mich., announce the introduction of the "Strait-Line Automatic Polisher and Buffer," for automatic finishing of any type of work not requiring rotating work fixture. Illustration shows equipment in use for polishing and buffing tops and inside edges of hinges of ventilator doors for automobile hoods. Top and part of inside edge of hinge is polished in one pass across the machine; production is 900 finished pieces per hour.

New "Strait-Line" Automatic Polisher

The manufacturer states that wheels used on the equipment can be set at any angle from horizontal to vertical, and machine is not limited by width, number of wheels, or length. Spindles are arranged for oscillation and adjustable pressure or yield to give the cushion effect necessary in polishing and buffing. Automatic composition feeders supply composition to the wheels by compressed air through flexible tubes and nozzles which are adjustable to provide a discharge suitable for various wheel widths and contours, either intermittently or continuously.

Cast iron platens of caterpillar conveyor are machined true as surface plates, are heavy and aligned for any type of fixture or adapter attachment. This permits side as well as top polishing. The platens are mounted on hardened rollers and are chain driven on continuous rails.

Polishing heads are complete motor driven units, multi-V belt driven, with variable speeds available either through variety of sheave diameters or by use of Hammond variable speed pulley.

Palladium Leaf

The metals of the platinum group have long been known for their high degree of utility. After several years of experiment, one of the platinum metals, palladium, is available in the form of leaf, making possible its use as a decorative medium for a wide variety of purposes. Palladium leaf has been perfected by the American Platinum Works, Newark, N. J. Heretofore only gold provided a non-oxidizable leaf for decoration. It is now possible to obtain this essential feature of gold in a white metal. Palladium leaf has a pleasing white permanent color, unaffected by atmospheric conditions, which remains untarnished even by lengthy exposure to air containing traces of sulphur, it is stated.

Palladium leaf can be used in architectural designs, interior decoration, and murals. It also lends itself to book stamping and stamping of leathers for fancy foot wear. It is applicable to furniture, picture frames, sign painting, jewelry display cases, etc.

Various tests have shown it can be applied as readily as gold leaf to wood, glass, metals, leather, artificial leather, paper,—in fact to any material to which gold leaf might be applied, it is stated.

Palladium leaf is produced in the standard sizes and forms to which the trade is accustomed; in books of plain leaf or in rolls of mounted leaf.

Sand Screening Equipment

The Beardsley and Piper Company, 2541 North Keeler Avenue, Chicago, Ill., offers the "Screenarator," a machine which is said to screen, aerate and pile sand for foundries.

A number of features are stressed by the manufacturer. It is stated that the machine is suitable for large or small plants; operates at high speed, easily and economically; thoroughly screens and mixes the sand and gives it a primary aeration on a corrugated reciprocating screen; screens out all refuse, leaving it at the side, away from the heap of screened sand.

The machine has a large hopper which is 15 inches from the floor, facilitating the work of two shovelers. Two horsepower motor drives it. It is portable on 24 inch steel wheels having 4½ inch tread.

Rotary Hearth Furnace for Heat Treating Metals

W. S. Rockwell Company, 50 Church Street, New York, offers the Rockwell rotary hearth furnace for heat treating and forging ferrous and nonferrous metals. The furnace is operated by electricity or fuel.

Operating advantages of the equipment are given by the maker as follows: continuous maintenance of heating area at substantially full load; less temperature fluctuation and loss of time and heat in charging and discharging; greater output for given heating area; steady working conditions for operative, with constant charging and discharging; improved control of time factor.

Complete information is available on application to the manufacturer.

Metal Drying Equipment

Hanson-Van Winkle-Munning Company, Matawan, N. J., offers a completely modern centrifugal metal dryer. It is stated that the machine is capable of drying 125 pounds of small plated work in 2 to 3 minutes. It requires a space 4 by 5 feet. Ten features of the machine are listed, as follows:

No tarnish, oxidation or spots; bright and uniform finish; no tumbling; no mutilation; no sawdust, mess or dirt; minimum floor space requirement; minimum labor and handling; no screening; removable basket for carrying plated work; high capacity for time requirement, 125 pounds in 2 to 3 minutes.

Spraying Equipment

Plummer Spray Equipment Corporation, Napoleon, Ohio, offers a complete line of spraying equipment for metal finishing and other purposes. The company specializes in small portable outfits, including compressors, guns and accessories.

The company also manufactures air conditioning apparatus for industrial use. Ventilating and exhaust fans, spray booths for finishers, and a wide variety of kindred equipment are also manufactured.

The company makes a special pneumatic hammer for sheet metal.

A complete catalog showing the full line is available on request to the company.

Full Automatic Barrel Plating Machine

A new full automatic barrel plating machine is being offered to the industry for the plating of small parts such as bolts, nuts, washers, small stampings, etc., by Frederic B. Stevens, Inc., Detroit, Mich. This machine is the invention of Albert H. Hannon. The machine may also be used for any processing operation such as cleaning, pickling, or any electro chemical operation.

In this machine the parts to be plated or processed are loaded into perforated drums made of insulating material. When loaded the drums are conveyed through the cleaning, rinsing, plating and drying operations automatically. When these operations are completed, the drums are automatically unloaded.

While the drums are being conveyed through the various solutions, they rotate to mix up the parts and expose all surfaces to the anodes. The movement through the solution, in addition to the agitation due to the revolving of the drums, causes the parts to pass continually through a new and enriched solution, preventing hydrogen occlusion, the maker states.

Current at 6 volts is used. A large decrease in energy consumed has been made possible by eliminating the resistance due to a new construction of perforations in the barrel, it is stated. All the operations of cleaning, rinsing, plating and rerinsing are done automatically; instead of cleaning in plain alkali solution and in a plain acid tumbling barrel, the parts are revolved in a tank where current is used for electro-cleaning and electro-pickling. This speeds up the action of the cleaning, promotes perfect and uniform cleaning, and prevents over-pickling, it is stated.

The drums are removably attached to shafts which are pivoted to the conveyor chain. Pinions are keyed to each shaft which mesh with a rack to cause the drums to revolve as they are conveyed through the various tanks and the parts are being plated.

Variable speed mechanism is provided to permit regulation of time of deposit. Provision is also made in some cases to permit rotation of drums at any speed desired, regardless of speed of conveyor chain. Thus, flexibility is provided to meet any plating condition encountered in barrel plating, with the addition of automatic handling, providing uniform results and saving electrical energy, etc.

The lifting means is a bell crank with a hardened steel roller at each barrel shaft. When reaching the end of each tank, the roller rolls up on a cam, causing the barrel to rise and move over the end of the tank and then lower into the next tank.

Mineral Core Oil

"Houghton's Core Oil," a new book published by E. F. Houghton and Company, Philadelphia, Pa., describes a new mineral-base core oil for which many outstanding advantages are claimed. It is stated that the oil develops greater core strength at lower baking temperature and in a shorter baking time; produces very little gas on casting, eliminating blow-hole losses; cores made with this oil are said to be impervious to water and will absorb only about 20 per cent as much moisture on standing as do cores made from linseed base core oils; residual heat given up by the castings while cooling breaks down the binding strength of the core oil to such an extent that cores come out much more easily in cleaning, and cleaning costs are reduced by 20 per cent to 40 per cent in many instances.

Due to the fact that it does not oxidize when exposed to the atmosphere, it can be mixed with sand and allowed to stand for several days without the sand hardening up and requiring re-mulling before use, it is stated, and never becomes sticky or gummy in the core box, and the cores come out clean.

A booklet thoroughly describing the use of this new core oil can be obtained by addressing the Houghton company.

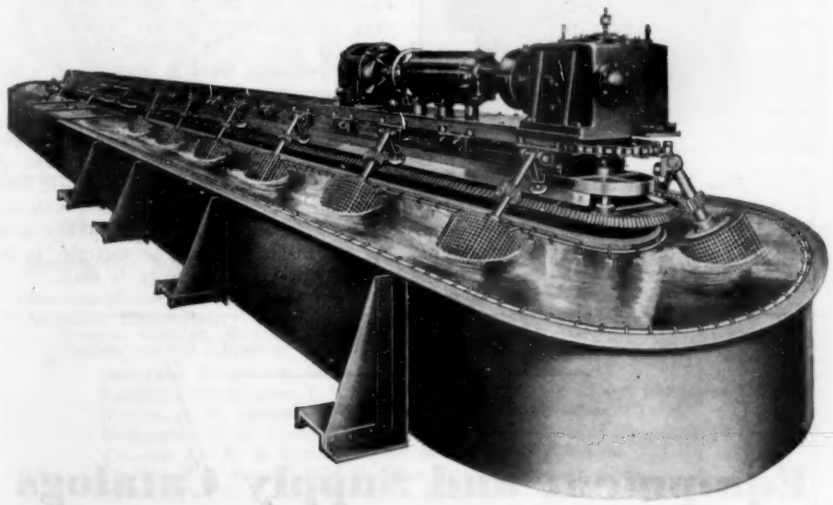
New Equipment for Electroplating

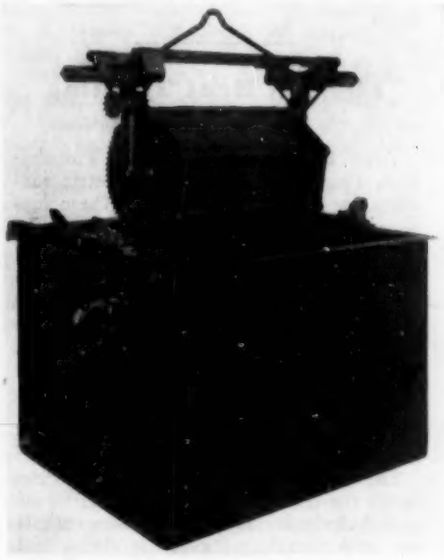
National Steel Products Company, Dayton, Ohio, has placed on the market a new type of barrel plater, which has been added to its line of plating equipment. The National line, which superseded the company's "Crown" line of equipment, is said to have resulted from years of experience in manufacture of this type of equipment.

The National barrel plater is made in bale and lift arm types, embodying certain new features of design, it is stated. Tanks are of double welded sheet steel; of unusual capacity; tested thoroughly for leakage, and protected against corrosion. Tanks are equipped with insulated anode bars of large current carrying capacity and brass cathode contacts fully insulated. Provision is made for exact automatic location of cylinder contacts in cathode contact saddles. Anode bars and cathodes are connected by flat bus bars, fully seated and protected against corrosion at points of juncture. Lined cypress tanks or rubber lined steel tanks can be provided. Tanks will be equipped with heating or cooling coils or provision made for application if specified.

Cylinders are suspended in hangers of rugged design. The hanger frame and cathode connecting points are cast integrally and become the electrical connection when the cylinder is in operating position. The hanger has two contacts on the drive end and one on the opposite end, giving the assembly a desirable three point suspension. The removal of two standard hex nuts permits dis-assembly of entire hanger mechanism. Ample current carrying section is provided and the lower end of the bronze hanger frame becomes the cylinder shaft bearing. The lower end is insulated to a point above the solution line with moulded hard rubber.

Driving pinions and shaft are carried in the hanger and are in constant mesh with the main cylinder drive gear. The drive pinion meshes automatically with the motor pinion when the cylinder is in position. Tie





Above—New Stevens Full Automatic Barrel Plater. At Right—New Barrel Plater by National Steel Products Company.

and spacing rods complete the assembly, along with a suitable lifting eye.

In the lift arm type the cylinder is carried between insulated arms which act also as current conductors. These arms are mounted on a shaft driven by worm and gear. All parts are insulated where necessary.

The machine is equipped with directly connected individual motor drive as standard. The motor and primary speed reducer are built as a single unit.

Moulded hard rubber was selected as standard for plating machine cylinders after exhaustive experiments and long service tests. Attention is called to the means of supporting the door panel of the cylinder. Full length support in the rail slot is used on one side, and convenient friction-controlled locking bars on the opposite side. Locking latches prevent loss of these parts or door locking device opening while cylinder is in operation. Cylinders are equipped with short shafts at each end with wheel type danglers having insulated hubs and spokes which are easily removed for stripping and replacing. Through shaft and "hair pin" type danglers can be furnished if specified. Cylinder made of formica or micarta are furnished on request.

Electric Heat Treating Furnaces

Ajax Electric Company, Inc., Philadelphia, Pa., offers a variety of electric furnaces for heat treating metals. These furnaces are made in a variety of types, for specific purposes. The furnaces are available in either continuous operating or batch types, to meet requirements of users. The company is prepared to submit designs for furnaces applicable to specified uses.

A very good catalog giving very adequate descriptions and full-page illustrations of many of the heat treating furnaces made by the Ajax company is available to interested concerns.

The Ajax company states that it has obtained the American rights to a number of special designs. These include a continuous strip annealing furnace for brass and copper, which is also possibly applicable to other metals.

Developments in Metals

GOLD jewelry, trinkets and valuable art creations in the precious metal are being melted up in England by owners seeking to profit by a premium being paid on the gold sovereign, the gain being about seven shillings in the pound.

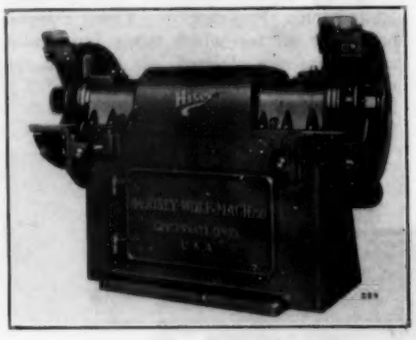
Gold ornaments and inlaid jewelry was included in a discovery of a treasure buried at Visby, Sweden, during the time of the Vikings.

TIN, LEAD and ZINC are being alloyed to form a coating on sheet steel in order to apply to the steel a felt covering by a process developed at Mellon Institute of Industrial Research, Pittsburgh. The product, known as R-B-M (Robertson-Bonded-Metal) was developed by Dr. A. W. Coffman. It is said to be useful as roofing, house siding, pipe lining, etc. The felt is applied by heating the alloy coating to just above the plastic point, just below liquefaction, when it becomes a bonding medium for the felt and steel.

ALUMINUM ALLOY has been adopted as a suitable metal for the manufacture of watches. A wrist watch has been marketed made almost wholly (97%) of aluminum, and its lightness makes it especially desirable, it is said.

Heavy Snagging Grinder with Independent Spindles

The Hisey-Wolf Machine Company, Cincinnati, Ohio, announces a new heavy duty snagging grinder having independent speed control for each wheel. The machine is stated to provide high efficiency, since speed of a smaller wheel is not



New Hisey-Wolf Grinder.

affected by operation of a larger, slower wheel. The new equipment is made in sizes for 20, 24 and 30 inch wheels, either high speed or vitrified, with spindle speeds to correspond. Ball or Timken roller bearings are optional. Drive is V belt; any stock motor can be used; automatic belt tension adjustment is provided. Other features mentioned are riveted plate steel guards with exhaust connection and bayonet type doors; steel spark arrester adjustable to wheel wear; chrome nickel steel spindle, heat treated before machining, accurately ground; wiring encased to meet underwriters' requirements; sturdy, ample, easily adjusted tool rests.

Electrode for Welding Aluminum

The Lincoln Electric Company, Cleveland, Ohio, announces a new electrode for welding aluminum, known as "Aluminweld." The new electrode is a 5 per cent silicon aluminum alloy, and can be used for welding sheet or cast aluminum. It is designed for either metallic or carbon arc welding. It is provided with a coating which prevents excessive oxidation and will dissolve any aluminum oxide that might be formed. The manufacturers claim that the coating assists in giving a very smooth operating arc which is particularly essential in welding aluminum.

The resulting weld is very dense, without porosity, and possesses high tensile strength. The weld can be polished satisfactorily with practically no discoloration, it is claimed. In its use a short arc of approximately 20 volts should be held with the coating practically in contact with the work. The current used will vary with the thickness of sheet or material to be welded. Reversed polarity is used.

Equipment and Supply Catalogs

Sodium Perborate. Roessler and Hasslacher Chemical Company, 350 Fifth Avenue, New York. Leaflet. Also, **Arctic,** a leaflet on a refrigerant.

Pickling Equipment. Weaver Brothers Co., Cleveland, O. Bulletin on new baskets, tank lining compound, inhibitor, pickle pills, steam jets, etc.

Testing Machines. Baldwin-Southwark Corporation, Philadelphia, Pa. Bulletin 28, giving considerable technical data on equipment for physical tests.

Skin Troubles in Industry. Cleanliness Institute, 45 East 17th Street, New York. Leaflets on benefits of personal cleanliness to workers and employers.

Nickel Solution Test Sets. Hellige, Inc., 179 East 87th Street, New York. Booklet on comparators for acidity test and nickel determination, for platers, chemists, etc.

How to Run a Lathe. South Bend Lathe Works, South Bend, Ind. The 30th edition of a valuable manual of lathe work. 160 pages, 5 x 8 in.; illustrated; price, 25 cents.

Regional Plan. Regional Plan Association, Inc., 400 Madison Avenue, New York. Information Bulletin 7 on present distribution and future growth of population in the New York Region.

Motors. Wagner Electric Corporation, 6409 Plymouth Avenue, St. Louis, Mo. Bulletin 174, 22 pages, illustrated, on squirrel-cage motors. Gives application tables, engineering and construction details, etc.

Condenser Tubes. American Brass Company, Waterbury, Conn. A very fine booklet on Anaconda "Super-Nickel" and "Ambrac" condenser tubes, giving specific properties and service records. Very well illustrated.

Ventilation. Ilg Electric Ventilating Company, 2850 North Crawford Avenue, Chicago, Ill. Complete catalog of self-cooled propeller fans, fully illustrated. Bulletins on small ventilators and the "Ilg-Kold Ice Kooler."

Current News of Associations and Societies

American Electroplaters' Society

Milwaukee Branch

Milwaukee Branch, American Electroplaters' Society, will hold its annual educational session and smoker, Saturday evening, April 30, at the hall, Northwest corner of North Third Street and Highland Avenue, Milwaukee.

The educational session will begin promptly at 7:30 P. M. All platers and their friends, as well as chemists and manufacturers interested in electroplating and finishing, are cordially invited to attend the session and also the smoker and entertainment which will follow the session.

A good program of papers and talks is being prepared, and there will be plenty of the refreshments and good cheer for which Milwaukee is noted. The smoker takes the place of the customary annual banquet.

The committee has plans which will make the smoker a long remembered event, and urges everyone to attend without fail.

New York Branch

The regular meeting of the New York Branch, A. E. S., was held Friday, March 11, at the World Building. The meeting was called to order by Mr. Ralph Liguori, president.

The banquet of the New York Branch was quite a success, considering the prevailing conditions in the industry.

The Branch has called a summons meeting for April 22, to vote whether the Branch should increase its dues from $6.00 to $10.00 per year for the purpose of forming a chemical class and having a laboratory.

There were many opinions during technical discussion at the meeting as to whether nickel-plated work becomes passive when not chromium plated within a few days. Anodes for rhodium plating were also discussed. The statement was made that platinum anodes were not necessary for rhodium plating. Carbon anodes not containing any graphite are used to good advantage instead of platinum anodes, it was stated.

JOSEPH MUSANT, JR.,
Recording Secretary.

St. Louis Branch

The St. Louis Branch of the American Electroplaters' Society will hold its annual educational session on Saturday afternoon, April 9, at the American Annex Hotel, St. Louis. Immediately preceding the session, there will be a luncheon at the hotel. The luncheon will begin at 1 P. M. Reservations for the luncheon should be made with E. J. Musick, 206 South 9th Street, St. Louis, Mo.

A good program has been arranged for the session, including the following papers:

"Diagnosing and Correcting Faulty Solutions," by Dr. Stout of Washington University.

"Some Production Methods Used in Chromium Plating," by Burton G. Daw.

There will be other papers also, and all papers will receive adequate discussion. All platers, chemists, manufacturers and others interested in plating and finishing are urged to attend both the luncheon and the session.

Los Angeles Branch

The Los Angeles Branch held its third annual educational session, followed by a dinner dance, on March 12, at the Alexandria Hotel, Los Angeles, Calif. The attendance exceeded expectations, and the affair was a complete success.

A full report, giving the winners of various prizes, will be included in our May issue.

American Zinc Institute

An important feature of the fourteenth annual meeting of the American Zinc Institute will be a discussion of the Better Galvanizing Campaign recently organized by the Institute. The meeting will be held at the Statler Hotel, St. Louis, Mo., on April 18, 19 and 20, 1932.

At the St. Louis meeting complete reports will be made by officers and field representatives of the Institute, showing the progress of this campaign. The entire day of Tuesday, April 19, has been reserved for this discussion. Representatives of the galvanizers will also attend, and the subject will be further discussed by representatives of distributors, dealers, consumers, agricultural extension departments, farm publications and others.

Directory of Metal and Finishing Associations

INFORMATION NOT LISTED CAN BE OBTAINED BY APPLICATION TO METAL INDUSTRY

American Foundrymen's Association, 222 West Adams Street, Chicago, Ill.

American Electroplaters' Society, care of H. A. Gilbertson, 434 South Wabash Avenue, Chicago, Ill. Secretaries of Branches of the American Electroplaters' Society are the following:

- **Anderson**, Ind., R. M. Wagner, 28 West 12th Street.
- **Baltimore-Washington**, I. H. Hahn, 207 South Sharp Street, Baltimore, Md.
- **Boston**, A. W. Garrett, 45 King Street, Dorchester, Mass.
- **Bridgeport**, T. H. Chamberlain, 859 Orange Street, New Haven, Conn.
- **Chicago**. Ill., E. G. Stenberg, 2200 North Kenneth Avenue.
- **Cincinnati**, A. Yeager, 2021 Sherman Avenue, Norwood, Ohio.
- **Cleveland**, P. R. Stamm, 947 Elbon Road, Cleveland Heights, Ohio.
- **Dayton**, Ohio. W. Protsman, 141 Westwood Avenue.
- **Detroit**, Mich., C. M. Phillips, 18933 Hickory Avenue.
- **Grand Rapids**, Mich., J. Van Dyke, 1361 Union Avenue.
- **Hartford-Connecticut Valley**, V. Grant, 32 Jennings Road, Bristol, Conn.
- **Indianapolis**, Ind., L. Mertz, 1725 Union Street.
- **Los Angeles**, Calif., M. D. Rynkofs, 1354 West 25th Street.
- **Milwaukee**, Wis., F. J. Marx, 1431 West Cherry Street.
- **Montreal**, Quebec, Canada, Charles Doherty, 1437 Aylmer Street.
- **Newark**, G. Reuter, P. O. Box 201, Newark, N. J.
- **New York**, J. E. Sterling, 2581 46th Street, Astoria, L. I.
- **Philadelphia**, J. E. Underwood, 327 North 10th Street, Camden, N. J.
- **Pittsburgh**, S. E. Hedden, 227 Fifth Street, Aspinwall, Pa.
- **Providence-Attleboro**, J. H. Andrews, 19 Rosedale Street, Providence, R. I.
- **Rochester**, N. Y., C. Griffin, 24 Garson Avenue.
- **San Francisco**, Calif., H. W. McKibben, 310 Tehama Street.
- **St. Louis**, C. T. McGinley, 8214 Fairham Avenue, University City, Mo.
- **Toledo**, J. M. Lee, Barker Street, Fremont, Ohio.
- **Toronto**, Canada, H. W. Graham, 102 Robina Avenue.
- **Waterbury**, W. F. Guilfoile, P. O. Box 961, Waterbury, Conn.
- **Worcester**, Mass., R. H. Bryant, 94 Grove Street.

International Fellowship Club, T. A. Trumbour, Metal Industry.

Institute of Metals Division, A.I.M.E., 29 West 39th Street, New York City.

American Electrochemical Society, Columbia University, New York City.

American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.

Institute of Metals (Great Britain), 36 Victoria Street, Westminster, London, S. W. 1, England.

Electroplaters' and Depositors' Technical Society (Great Britain), Northampton Polytechnic Institute, St. John Street, London, E. C. 1, England.

American Welding Society

The annual meeting of the American Welding Society will take place April 27-29 at the Engineering Societies Building, 33 West 39th Street, New York. There will be sessions on all phases of welding on all three days. The eleventh annual dinner, a stag affair, will take place Thursday evening, April 28.

Of special interest to the nonferrous industries will be the following papers:

Welding Duralumin, by H. S. George, research engineer, Union Carbide Carbon Research Laboratories; afternoon session, April 27, 2 P. M.

Welding of Extruded Metal, by I. T. Hook, research engineer, The American Brass Company, Waterbury, Conn.

Philadelphia Metals Assn.

At the fourth annual meeting of the Philadelphia Metals Association last month, Herman Ladenson was elected president to succeed Harry S. Goldstein of L. Goldstein and Sons. Other officers elected were: John T. Fegley, White Bros. Smelting Corporation, vice-president; Jacob Strauss, Ace Metal Company, treasurer; and John E. Fitzpatrick, secretary.

Waste Material Dealers

The National Association of Waste Material Dealers, Times Building, New York, held its annual general meeting last month at New York, electing a metal man, George Birkenstein of S. Birkenstein & Sons, Chicago, Ill., president.

The association's Metal Division elected Benjamin Friedman to a third term as chairman. The Division held a session at which several papers were presented. Thomas A. Wright of Lucius Pitken, Inc., New York, presented a plan for by-law revision which would call for organization of a permanent set of committees to study various phases of the scrap metal business, covering the scientific, technical and economic sides, and having representation from dealers, producers and consumers of scrap. A committee of five was appointed to consider the plan outlined by Mr. Wright.

New specifications of scrap aluminum of various grades were adopted and will be incorporated in the Association's classification list.

Papers were read by Julius Baer of the National Metal Exchange; and by O. H. Bauer of the National Battery Lead Manufacturers' Association. Mr. Baer explained hedging methods on the exchange, and Mr. Bauer's paper was an appeal for co-operation of the scrap dealers in making "scrapped" batteries unfit for rebuilding before releasing them.

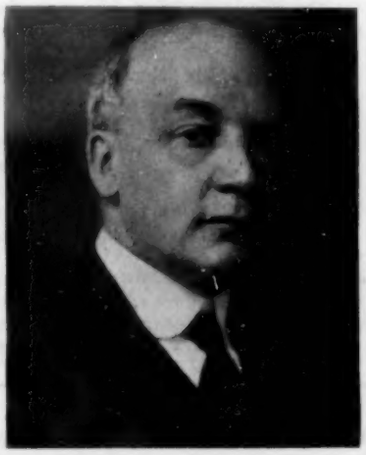
The following metal men are now on the board of directors of the N. A. W. M. D.: George H. Bangs, Nassau Smelting & Refining Company, New York; Louis Birkenstein, S. Birkenstein & Sons, Chicago; Benjamin Friedman, Hammond, Ind.; Harry S. Goldstein, L. Goldstein's Sons, Philadelphia; David Golub, Charles Harley Company, San Francisco; Jerome S. Katz, American Metal Company, New York; J. W. Paterson, Hudson Smelting & Refining Company, Newark, N. J.

Personals

Nelson W. Pickering

Nelson W. Pickering, who was recently re-elected president of the Farrel-Birmingham Company, Inc., Ansonia, Conn., has been identified with that company and its predecessor, the Farrel Foundry and Machine Company, during all of his civilian business career.

Mr. Pickering was born April 7, 1887, in Cambridge, Mass. He attended public schools in Roxbury, Mass., and prepared for college at Roxbury Latin School. In March, 1904, he was appointed to the United States Naval Academy from Massachusetts. After his graduation in



NELSON W. PICKERING

1908 he was assigned to sea duty and subsequently was selected for post-graduate instruction in ordnance engineering, which included duty at the Naval Gun Factory, Washington, D. C.; the Proving Ground at Indian Head, Md.; and the Bethlehem Steel Company. He then was sent to England to complete the instructional course at Barr Stroud Optical Works, Glasgow, Scotland, and the Whitehead Torpedo Works, Weymouth, England. Following another tour of sea duty, given over primarily to gunnery work, he served as Chief of Gun Section, Bureau of Ordnance, Navy Department.

Upon completion of this work he was assigned to duty overseas during the World War, and at that time visited the large industrial ordnance plants in England and France. After the Armistice he served for a year as gunnery officer of the U. S. S. North Dakota. During the war he was associated with Franklin Farrel, Jr., now chairman of the Farrel-Birmingham board of directors, who, recognizing his executive and administrative abilities, induced him to resign from the Navy and join the Farrel Foundry and Machine Company.

In November, 1919, Mr. Pickering started work in the Farrel roll department. He became successively assistant manager and manager of that department. In February, 1930, he was elected president, with executive direction of the company's plants at Ansonia and Derby, Conn., and Buffalo, N. Y.

Mr. Pickering is well known in the trade, having traveled extensively in the company's interests throughout the United States, Canada and Europe. He recently completed a trip to a number of European countries, including Russia, where he spent several weeks observing the Soviet industrialization program. He met many prominent figures in the Soviet government, and made many contacts which enabled him to view the Russian scene from angles not permitted to all visitors in that country.

With his resignation from active duty in the Navy, Mr. Pickering did not relinquish his interest in the service. He still holds a commission as lieutenant commander in the United States Naval Reserve, and commands the Naval Reserve Force and Naval Militia in the State of Connecticut. For six years he was naval aide to Governor Trumbull.

Mr. Pickering has his home at Ansonia, where he is active in civic and municipal affairs.

Dick Crane, Connecticut representative of the Lea Manufacturing Company, Waterbury, Conn., sustained a broken arm while playing basketball, and will be confined to his home for six or eight weeks.

A. E. Goldie, 561 East 108th Street, Cleveland, Ohio, has been appointed representative of the Chicago Flexible Shaft Company, Chicago, in the sale of Stewart industrial furnaces in the Cleveland territory.

A. J. E. Larson, vice-president and general manager, Art Metal Construction Company, Jamestown, N. Y., has been elected president of the Manufacturers' Association of Jamestown, succeeding **Nathan M. Wilson.**

V. P. Weaver of the technical department of the American Brass Company, Waterbury, recently addressed a meeting of the Connecticut Nonferrous Foundrymen's Association. His subject was "Copper and Its Alloys."

M. I. Dorfan, former manager of the dust collector division, Pangborn Corporation, Hagerstown, Md., has accepted a similar position with Blaw-Knox Company, Pittsburgh, which is entering the dust collector field. Two lines of equipment have been developd and are on the market; other lines are in process of development.

F. G. Cyrex has joined the Columbia Electric Manufacturing Company, Cleveland, Ohio, to organize and manage as chief engineer its new electrochemical division, which will handle a complete line of plating and polishing equipment and supplies. Mr. Cyrex until recently was with Hanson-Van Winkle-Munning Company of Matawan, N. J., as chief of their equipment division. He began his career in the industry with the old Hanson-Van Winkle Company in 1912. He was in the army during the war. After the war he resumed his business interests, and is well known in the finishing industry. He is 42, youthful, and married.

Obituaries

Richard H. Sliter

Richard H. Sliter, widely known in the electroplating and finishing industry, a member of the sales staff of Maas and Waldstein, Newark, N. J., died March 21, 1932. He had been in poor health for some time.

Mr. Sliter had a long and successful career. He was originally a foreman

RICHARD H. SLITER

plater, and as such he was president of the American Electroplaters' Society in 1913.

Mr. Sliter entered the platers' supply business with the Zapon Company as sales representative in the middle west. After some years with that company, he joined Maas and Waldstein in 1926. His friends in the plating industry were numerous and in all parts of the country.

Alex Pankratz

Alex Pankratz, founder and president of the Quality Aluminum Castings Company, Waukesha, Wis., died February 26, 1932, from an attack of pneumonia. Prior to the organization of the Waukesha firm, Mr. Pankratz served as superintendent of the Werra Aluminum Foundry Company, in Manitowoc, Wis. He is survived by his wife and nine children.

W. T. N.

George Eastman

The suicide last month of George Eastman, Rochester, N. Y., camera manufacturer, recalls the fact that the Eastman Kodak Company was an early user of sheet aluminum. In June, 1900, "The Aluminum World," which has since been combined with METAL INDUSTRY, reported that "the famous folding pocket Kodak . . . has been made for a number of years of sheet aluminum, covered with leather, and so popular has it become that the company is . . . putting on the market several larger sizes" with shells of aluminum.

John P. Fogarty

John P. Fogarty, 64 years old, of 75 Western Avenue, Westfield, Mass., a vice-president of the Westfield Manufacturing Company, former treasurer and director of the Cycle Trades of America, and former vice-president of the Bicycle Manufacturers' Association, died in his sleep in his room in Fort Harrison Hotel, Clearwater, Fla., March 3, 1932. He had been identified with the cycle trades for more than 40 years. Besides his wife he leaves two sons, John P. Fogarty, Jr., of Yonkers, N. Y., and Charles J. Fogarty of Westfield, Mass.; three sisters, and two grandchildren.

G. B. Y.

Edward F. Brackett

Edward F. Brackett associated with his brother in the metal firm of Henry F. Brackett and Company, Columbia Road, South Boston, Mass., died recently at the age of 69. He was engaged in the production of solder and babbitt and dealing in scrap metals with the Brackett company for more than 40 years. Of late he had been quite ill. The business will be continued as before.

Lloyd A. Sagendorph

Lloyd A. Sagendorph, president of the Penn Metal Company, Philadelphia, Pa., died March 8, 1932. He was 47 years old. Mr. Sagendorph was a native of Cincinnati, and a graduate of the University of Pennsylvania in mechanical engineering (1908). He is survived by his widow and three sons.

Charles E. Fellows

Charles E. Fellows, for many years in charge of sales of the Girard Smelting and Refining Company, Philadelphia, Pa., died of a heart attack the latter part of February, at his home at Swarthmore, Pa., Philadelphia suburb. Mr. Fellows was 56. He is survived by his widow and three children.

James W. Brown

Last month we made brief mention of the sadly premature death on February 18, 1932, of James W. Brown, well-known St. Louis, Mo., electrical expert.

Mr. Brown was widely known in the electroplating equipment industry as an extremely capable designer of low voltage generators. His accomplishments were such as to mark him among his associates in the trade as one of its most promising young men.

J. W. BROWN

A graduate of the University of Tennessee, he joined the Chandeysson Electrical Company, St. Louis, in 1923, and remained with that company until 1929. For Chandeysson he performed brilliant work, developing synchronous motor-generator sets, generators for platers, and designing generating equipment with directly connected exciters. I. P. Chandeysson, head of the company, says Mr. Brown, or "Smiling Jimmy," as he was called, displayed exceptional intensity and remarkable decisiveness in coping with problems of design and manufacture.

He left Chandeysson to take a position with the Westinghouse Electric and Manufacturing Company, where he stayed for a year. Then he went into business for himself, and gave every promise of making a great success of the enterprise. His death was a blow to the industry, and a shock to his many friends.

H. R. Corse

H. R. Corse, sales manager of the Lumen Bearing Company, Buffalo, N. Y., died of a heart attack February 20, 1932. Mr. Corse had been with the Lumen foundry since 1910, with the exception of six years, 1914-1920, when he was with Titanium Bronze Company, Niagara Falls, N. Y.

Charles B. DeLany

Charles B. DeLany, superintendent of the Columbus Brass Company, Columbus, Ohio, died recently in his sixty-eighth year, of pneumonia. Mr. DeLany had been associated with the brass firm for 35 years.

Emil Kluin

Emil Kluin, head of the Kluin Brass Foundry, Elizabeth, N. J., died recently in his eighty-second year. Mr. Kluin had been a foundryman in this country for forty years.

Industrial and Financial News

Big Radio City Order for American Brass Company

The American Brass Company, Waterbury, Conn., has been awarded a large contract for brass and copper products for use in construction of the "Radio City," in New York. It is reported 150,000 pounds of sheet copper, a million pounds of brass pipe, and considerable other materials are included in the order. Fabrication will be at the Ansonia and Waterbury plants of the company.

Columbia Electric Expands

Columbia Electric Manufacturing Company, Cleveland, Ohio, manufacturer of generators, motors and rheostats for electroplating, has expanded its lines to include a complete line of electroplating and polishing equipment and supplies. For this purpose an electrochemical division has been established, under F. G. Cyrex, who will be chief engineer and manager. He was formerly with Hanson-Van Winkle- Munning Company. (See page 168.)

Zinc Production in 1931

Department of Commerce, Washington, D. C., reports United States production of slab zinc in 1931 totaled 313,621 short tons, valued at $23,825,000. This includes 21,625 tons of secondary metal. The 1931 output was 41 per cent below 1930.

Rolled zinc production in 1931 amounted to 116,669,925 pounds, valued at $8,313,383. This was an increase of nearly 14 per cent in quantity, but a decrease of 4 per cent in value, as compared with 1930.

Lumen Bearing Company

Lumen Bearing Company, Buffalo, N. Y., has purchased at auction the plant, equipment, supplies, patents, etc., of Buffalo Bronze Die Cast Corporation.

Scrap Metal Dealers Under Fraud Indictment

Israel Ruderman and four other members of the Perth Amboy Iron and Metal Company, Perth Amboy, N. J., and William L. Beam, former weighmaster at the Kearney, N. J., plant of the Western Electric Company, have been indicted by the Hudson County, N. J., grand jury for fraud in connection with falsified weights of scrap metals delivered to the Perth Amboy company from the Western Electric plant, and by the scrap concern to the plant of the United States Smelting and Refining Company, where Beam had also been a weighmaster at one time. Beam is reported to have confessed that he took $50 weekly from Ruderman and his associates to add 20 per cent to the weights of metal deliveries by the Perth Amboy firm to the United States company's refinery. Later, he said, he obtained work at the Western Electric plant, which was selling scrap to the Ruderman firm, and he took $50 a week to subtract 20 per cent from the records of deliveries to the buyer.

Brass Ingot Business

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., for the month of February, 1932, amounted to 2,145 tons.

On March 1st, unfilled orders on the books of the members of the Institute amounted to 19,390 net tons.

New High-Conductivity Copper Developed

United States Metals Refining Company, Carteret, N. J., is producing on a commercial scale oxygen-free copper of high conductivity, with no residual deoxidant. The metal is the result of several years' research which indicated the necessity of new refining and casting procedure for production of such copper. The metal is produced to meet two specifications: Brand OFHC, for wirebars used in wire manufacture, as well as cakes and other shapes, coming under A.S.T.M. Designation B5-27 with regard to metal content and resistivity, and free from cuprous oxide as determined by the microscope; Brand OFHC Selected, which conforms to the specifications enumerated for OFHC, and in addition, meets the requirements of the Bell Telephone Laboratories, Inc., specification for submarine cables.

The first brand is recommended for high-grade fine and coarse copper wire, round and flat sections, for tubes, for sheets of all kinds, especially for spinning, deep-drawing, and for other purposes where the material is cold worked. Other uses include work requiring hot-forging, brazing, and welding. The selected brand is specified for electrical conductors such as continuously loaded telephone cables, and for uses where copper is subjected to reducing gases at elevated temperatures. Both brands offer greater resistance to fatigue than ordinary copper, it is stated.

Missing Brass Polisher Is Sought by Family

Joseph Sklar, a brass polisher, who disappeared from his wife and two children in New York in 1927, is being sought by the National Desertion Bureau, 67 West 47th Street, New York. Mr. Sklar is described as 44 years of age; 5 ft. 4 in.; 140 lbs.; clean shaven; black, graying hair, slightly bald. His family is destitute; one child, mentally deranged and lacking citizenship or support, is threatened with deportation.

Scovill Holds License for Chromium Plating

Scovill Manufacturing Company, Waterbury, Conn., metal manufacturers and fabricators, has had a license to operate chromium plating solutions under the patents of United Chromium, Inc., New York, since January 1, 1932, according to a statement by John H. Goss, vice-president of the Scovill company.

Zinced Sheet "Quality Seal" Granted More Firms

American Zinc Institute, New York, has granted licenses to use its "Seal of Quality" to 12 additional manufacturers of zinced (galvanized) sheets. This permits them to use the stamp indicating use of 2 ounces of zinc coating to each square foot of sheet. About 70 per cent of the galvanized sheet industry now uses the seal.

Corporation Reports

Corporation last month reported for the year ended December 31, 1931, as follows:

Federal Mogul Corporation; net loss $83,420; against net profit $84,452 for 1930.

Manning, Bowman and Company: net loss $259,943; against deficit $161,600 for 1930.

Aluminum Industries, Inc.: net profit $134,142; against $185,732 for 1930.

Reynolds Metal Company: net profit $1,510,852; against $1,778,273 for 1930.

Bridgeport Brass Company: net loss $423,602; against net loss $319,268 for 1930.

Pyrene Manufacturing Company: net loss $132,121; against net profit $262,-351 for 1930.

International Silver Company: net loss $1,464,906; against net loss $857,-783 for 1930.

McCord Radiator and Manufacturing Company: net loss $283,949; against net profit $10,807 for 1930.

International Nickel Company of Canada, Ltd.: net profit $5,094,497; against $11,770,060 for 1930.

Doehler Die Casting Company: net profit $139,113.

Scovill Manufacturing Company: net earnings $152,912; against $506,618 for 1930.

Revere Copper Brass, Inc.: net loss $2,811,941; against $7,701 net income for 1930.

Phelps Dodge Corporation: net loss $983,903; against $515,173 net profit for 1930.

American Telephone and Telegraph Company: net income $166,666,533, equal to $9.05 a share on capital stock, against the equivalent of $10.44 a share for 1930.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

April 1, 1932.

Local brass company officials were much incensed at the proposal in Congress to put a four cent tax on imported copper. **Congressman E. W. Goss,** son of **E. O. Goss,** president of the **Scovill Manufacturing Company** of this city, vigorously opposed it and succeeded in having the Ways and Means Committee reverse itself after it had first agreed to write this tax into the revenue bill. E. O. Goss, president of Scovill, **F. S. Chase,** president of the **Chase Companies,** and **John A. Coe,** president of the **American Brass Company,** were in Washington for several days conferring on the subject. Mr. Coe, when interviewed in this city, declined to say whether or not he opposed the proposed tax but said that if it were levied the brass manufacturers would "have to have the same amount added to the tariff on fabricated copper products." He said it would be hard to say what the effect would be, and it would have to be tried out first to see whether it would be a benefit or an injury to the industry. Congressman Goss, opposing the proposal, said it represented a rate of about 70 per cent, as contrasted with the manufacturers' sales tax of only 2.25 per cent.

Elton S. Wayland of this city, vice-president of the **American Brass Company,** receives a life interest in a $300,000 trust fund, half of his father's real estate and half of the residue of the estate, according to the will of John Elton Wayland, who died recently in New York.

John A. Coe, president of the American Brass Co., expressed optimism with regard to the future of the industry, at the annual dinner of the Industrial Foremen's club of this city, held last night.

Local factories are planning another drive for pledges for unemployment relief to replace those that expire May 1. Through them, practically all in the city who are employed donate from 1 per cent to 3 per cent of their weekly salaries to a fund whereby the unemployed are given work on public projects. The factories and many other employers pay into the fund weekly sums equal to that donated by their employes. The fund has been operating since November, 1930, and has collected and disbursed over $1,000,000. W. R. B.

Connecticut Notes

April 1, 1932.

New Britain—The Stanley Works declared the regular quarterly dividend of 37½ cents a share on the common and preferred stocks last month, payable April 1.

Landers, Frary and Clark directors have declared four quarterly dividends of 62½ cents a share for the next year, reducing the annual rate from $4 to $2.50. Sales last year were off 29 per cent from 1930, according to Charles F. Smith, chairman of the board.

American Hardware Corporation has voted dividends for the coming year at the rate of 50 cents a share per quarter, compared with $1 a share per quarter last year. President Kimball reported that sales were off 30% from 1930 and 48% from 1929. The P. & F. Corbin division of the **American Hardware Corporation** has received several large orders lately. One is for all the building hardware to be used in the Radio City in New York. Another is for about $100,000 for hardware for the Field office building in Chicago. Another is for about $75,000 and is for the hardware for the House and Senate office building. Still another contract just closed is for the hardware for the World's Fair buildings in Chicago.

New Britain-Gridley Machine Company has a net operating loss of $287,106 last year, and after paying dividends amounting to $106,960, a total of $394,067 was deducted from the surplus account.

Hartford—The Silex Company has contracted with the **General Electric Company** whereby it will manufacture the General Electric "Silex Coffee Maker," an electric coffee urn.

The Holo-Krome Screw Corporation had an increase of 150% in volume of business in 1931 over 1930, it was reported at the annual meeting last month.

Colt's Patent Fire Arms Company directors last month declared a quarterly dividend of 25 cents a share, payable April 1. Last year the quarterly dividend was 37½ cents, and previous to that the rate was 50 cents.

Bridgeport—Judge Carroll Hincks in the United States District court last month decided that the United States Internal Revenue Department must return to American Chain Co. $600,136, representing overpayment of tax and interest on the overpayment. The company's suit was based on its returns in 1923 and 1924 for taxes on the sale of tire chains used on non-taxable vehicles such as tractors and fire engines.

Remington Arms Company officials deny reports that the working force has been materially increased recently. The volume of business in 40 caliber ammunition has been slightly more active.

Bullard Company reports for last year a net loss of $369,420 after charges.

New Haven—The New Haven Clock Company reports a loss of $483,957 after taxes, depreciation and other charges, compared with a loss of $350,904 in 1930.

The Acme Wire Company reports a net loss of $198,797 for 1931, compared with a net loss of $219,380 for 1930.

Winchester Arms Company officials state that since the first of the year the working force has been increased by about 250 additional workers. Ammunition requirements that are most active are for 22 caliber bullets for army rifle practice. The company is also working on two new models of sporting guns.

Torrington — The Torrington Company has declared the regular quarterly dividend of 75 cents a share, payable April 1. The company will complete the removal of the **Lydalls and Foulds Needle Company** equipment from Manchester, N. H., this month. The latter concern, recently purchased, employed 53 persons at the time of the purchase, but previously had employed many more.

Meriden—The International Silver Company reported an operating loss of $778,845 for 1931, compared with a loss of $240,726 in 1930.

Stamford—Yale and Towne Manufacturing Company has declared a dividend of 25 cents a share payable April 1. This is the same dividend as last quarter.

Norwich—The United Metal Manufacturing Company has been placed in temporary receivership with James E. McCormick, treasurer and resident manager in charge.

Thomaston — Fire completely destroyed the factory of the **Thomaston Knife Company,** which has been closed for about a year. W. R. B.

Springfield, Mass.

April 1, 1932.

Employment figures have been slightly on the upward trend in the 26 metal industries in western Massachusetts during the last month.

Electric fan and refrigeration shipments from the East Springfield plant of the **Westinghouse Electric and Manufacturing Company** have increased markedly the past three weeks, and even further gains are expected the next few weeks. The number employed at the plant remains about 3,000. The Chicopee Falls plant may receive a contract from the Navy Department for the construction of 68 500-watt radio transmitter sets for ship use, in view of the fact that the company made the lowest bid for the business. Estimated at $300,000 it would mean a big increase in the staff at the plant. If the contract is received production of the new unit is expected to start shortly. At both of the plants inquiries on various

articles have been greatly increased and bids have been requested by several large firms.

Central Specialties Company plant, Westfield, has been very active the last few weeks, and crews have been called for night work in the metal spraying department. Many firms throughout the section have become interested in the work done by the Westfield firm and have requested further information on the machine salvage work.

Indian Motocycle Company plant is in a decidedly better position, with orders for machines from 19 state police departments throughout the country. There is a possibility that more orders will be forthcoming in view of a survey in Washington seeking to interest government officials in the purchase of Indian motorcycles by the District of Columbia police and several of federal departments.

United American Bosch and **Moore Drop Forge** companies are rushing orders for the automotive industry and employment conditions at both of the plants are the best in months. **Van Norman Machine Tool Company** has orders from several automobile firms for equipment, and conditions are decidedly improved. Orders at the **Westfield Manufacturing Company** have been coming in rapidly, and the firm has been maintaining a large staff. Special machinery and machine tool firms, as well as foundries throughout the district, report a slight increase in business. Conditions at the **Cheney-Bigelow Wire Works** are reported fair.

J. Stevens Arms Company, Chicopee Falls, reports improved prospects for spring business, due in part to a new double-barrel, single-trigger shotgun recently put on the market. Two new models of target rifles are scheduled to come out this spring.

The 34th Annual Metal Trades Convention to be held at the Hotel Commodore, April 20-21. Representatives from the western Massachusetts area will include **Allistair R. Tulloch** of Springfield, president of the National Association of Metal Trades Association Secretaries, and Secretary of the Western Massachusetts Metal Trades Association; **Hugh Benet,** president of the western Massachusetts branch of the Worthington Machine and Pump Company of Holyoke; **Roe S. Clark,** treasurer of the Package Machine Company and member of the American Council of Metal Trades Associations; **C. A. Mayer,** factory manager and A. B. Howe, and labor Superintendent of the United American Bosch Company; **L. J. Chandler** of the Chandler Company; and **Charles R. Hastings,** treasurer of the local Hastings and Schoen Company.

Norman R. Clarke, secretary of the Westfield Manufacturing Company of Westfield, Mass., has been named vice-president of that concern, to succeed John P. Fogarty, who died last month in Florida. **Charles J. Fogarty,** son of the late vice-president, was elected secretary. G. B. Y.

Middle Atlantic States

Trenton, New Jersey

April 1, 1932.

There has been little change in the metal industry during the past month, but manufacturers are hopeful that spring will show an increase in business. The closing down of the big plant of the **J. L. Mott Company** has caused some of its old orders to be filled at other factories. Working hours remain the same at the **John A. Roebling's Sons Company** and the **Trenton Brass and Machine Company.**

Six thousand pieces of ware and 400 tons of selected clays were sold at receiver's sale at the Mott plant early in March, and the place is now closed for good. **Citron-Byer Company** purchased all the staple fittings, while the wares were sold to individuals. The Robertson Art Tile Company, of Morrisville, Pa., purchased all the clays and chemicals of the firm. Federal Court authorized the sale. **The Mott plant was formerly** one of the most prosperous in Trenton; it once had 1,200 workers.

Following New Jersey concerns have been incorporated: **Stellar Lamp Company,** Edgewater; manufacture lamps; $2,000 capitalization. **Royal Battery Corporation,** New Brunswick, manufacture batteries; $125,000. **National Forge** Inc., Hoboken; metal products; 1,000 shares no par. **Rex Manufacturing Company, Inc.,** Harrison; radio tubes; $50,000 and 750 shares common. **Poellot Sheet Metal Works, Inc.,** Guttenberg; $25,000. **Metal Process Corporation,** Paterson; chemicals; $15,000.

C. A. L.

Newark, New Jersey

April 1, 1932.

Because the Internal Revenue Service has refused to sanction a reduction in the taxable income of the **Atlas Valve Company,** 282-86 South Ninth Street, representing the premiums on insurance policies on the lives of three of its officers, steps have been taken for a hearing before the United States Board of Tax Appeals. The company has petitioned for redetermination of an income tax deficiency in the amount of $420.39, alleged to exist by the Collector of Internal Revenue but denied by the petitioners. The corporation claims that its directors on January 1, 1929, voted increased salaries to the three officers and that as a part of the increase premiums on life insurance policies were paid. These officers recognized the increase and reported them in their personal income tax payments.

Vice-chancellor Church has appointed **Harry G. Hendricks** and **Ronald S. Sloat** co-receivers for the **S. B. R. Specialty Company,** 17 Princeton Street, East Orange, and has asked interested parties to show cause why the receivership should not be continued. Sloat is vice-president of the defendant company, which make ball bearings. Consent to the appointment was given by **John D. Thomson,** president of the specialty company. Application for the receivers was made by **Jacob Mellinger** in behalf of the **Strom Steel Ball Bearing Company,** a creditor. Insolvency was charged, and it was asserted that the defendant had been unable to meet its payroll for several weeks and had been running at a loss. The S. B. R. company was incorporated Jan. 24, 1932.

Following Newark concerns have been incorporated: **New Gem Manufacturing Company;** hardware; 1,000 shares common. **Sonolux Laboratories,** Newark; lamps; 2,500 shares. C. A. L.

Central New York

April 1, 1932.

With Utica celebrating its 100th anniversary as a city during the month of March, metal manufacturers are joining in the observance through exhibits in hotel lobbies, advertisements in the Central New York papers, and through historical pamphlets and interviews given to local papers.

American Emblem Company, Inc., Utica, from the manufacture of a limited line of rings and school pins when it organized in 1915, now works in every known metal, serving every state in the Union. Plant officials say they can refer to the manufacture of some item for practically every well known firm in the United States. The company has capacity for 300 employes and does $1,000,000 business annually. Its plant is set up to plate in nickel, chromium, and all precious metals.

A delegation of school children from the Utica Free Academy and the New Hartford High School made an inspection of the **Oneida Community, Ltd.,** plant at Sherrill, N. Y.; they will write essays on plant operation.

Another concern joining in the Centennial Celebration is the **Bossert Corporation,** one of Utica's largest factories. This plant has 210,000 square feet of floor space, turning out parts for automobiles, electric and gas refrigerators, washing machines and other products.

Of the younger concerns joining in the celebration of the city's 100th anniversary of industrial growth is **Emil Steinhorst and Sons, Inc.,** in which Emil Steinhorst, president, and his eight sons are associated. The company makes all types of sheet metal products to order.

Perhaps the greatest number of items made by a fishing tackle concern are turned out by the **Horrocks-Ibbotson Company,** Utica. This concern started 120 years ago at 48 Genesee Street.

Harry Demarest Baldwin, cutlery maker, died at his home in Jamestown, N. Y., March 23, 1932. Mr. Baldwin was owner of the **Baldwin Cutlery Company,** which, until it went out of business several years ago, had plants at Jamestown, N. Y., and Tidioute, Pa. He was famed for his slogan: "No pocket knife is a real knife without a brass lining." E. K. B.

Middle Western States

Detroit, Michigan

April 1, 1932.

It has been a month of marking time in the non-ferrous metal industry in this area. None of the big plants are operating to any extent. Motor car manufacturers are waiting for Ford to show his hand. Every one is guessing and uncertain. As soon as this is eliminated, which seems imminent at this time, the big motor and accessory plants will get under way. Predictions are that extensive operations will start around April 10.

Manufacturers of iceless refrigeration units, also extensive users of brass, copper, etc., have been maintaining extensive production for some time. This industry gives promise of continuing active for a long time.

Plumbing and steam fitting manufacturers show little activity.

Platers are anticipating better conditions. They are dragging along with the motor industry, with which they are closely allied in the Detroit area.

Motor and Machinery Casting Company will erect a foundry building on Davidson avenue.

Long Manufacturing Company has started production of copper radiators for domestic, industrial and general heating purposes. This concern heretofore has only produced automotive radiators in addition to its line of automotive clutches.

For the first time in motor car manufacturing, it is claimed, automobile bodies are being completely rust-proofed. **Dodge Brothers** are the builders responsible for the introduction of this improvement. Bodies used in the production of Dodge cars are now treated by the "Parcolite" process, said to be an advancement over any rust-proofing method yet developed.

Great Lakes Manufacturing Company, Fourth and Mulberry streets, Wyandotte, Mich., was recently incorporated. This concern manufactures brass, bronze and gray iron castings. The owners are **Thomas H. Conway, Veronica Conway** and **Lewis H. Daily.** Capital stock is $20,000.

Aluminum Musical Instrument Company, Ann Arbor, Mich., recently became a Michigan Corporation. Concern specializes in the production of musical instruments. Those interested are **Joseph E. Maddy, Thaddeus P. Giddings** and **Marie C. Maddy.**

Auto City Plating Company, 6006 Cass Avenue, recently increased its capital stock from $3,000 to $15,000.

Manufacture of camshafts and crankshafts, a new line of products, by the **Campbell, Wyant and Cannon Company,** Muskegon, Mich., will be started soon, it is announced. A metal known as "Proferal," recently developed, is to be used.

Charles H. Crockett, retired consulting engineer of the **Detroit Lubricator Company,** passed away at his home in Detroit last month. He was 80 years old. He came to Detroit 24 years ago and later became affiliated with Detroit Lubricator. He was active in research work prior to his retirement a few years ago.

Motor City Plating Company, 994 Catherine street, recently changed its capital stock from $40,000 to $3,000.

J. O. Eaton, chairman of the board, **Wilcox-Rich Corporation,** division of **Eaton Axle and Spring Company,** announces purchase of assets and business of **Holley Permanent Mold Machine, Inc.,** Detroit. The purchase was made by **Eaton-Erb Foundry Company,** Vassar, Mich., formerly Erb-Joyce Company, subsidiary of Wilcox-Rich. Foundry and machine equipment purchased will be transferred to Vassar, but sales offices will be maintained at the Wilcox-Rich general offices, 9771 French road, Detroit.

Dow Chemical Company, Midland, announces completion of the building of its new rolling mill at that place, in which "Dowmetal" in sheets and plates will be produced. The plant has 20,000 square feet of floor space.

Welding Machines Manufacturing Company, 17325 Lamont avenue, Detroit, has recently been incorporated. Capital stock is $10,000.

F. J. H.

Toledo, Ohio

April 1, 1932.

Metal plants in this area are preparing for increased production which is expected to start early in April. Many engaged on motor car parts are ready to start as soon as the big plants in Detroit get under way.

Plating plants here have been in moderate production for a considerable time. Toledo, unlike other industrial centers along the Great Lakes, is blessed with varied industries, and many of these, while far under their ordinary schedules of production, have not been altogether idle. Some operate their own plating departments.

O. B. Mueller, president, **Mueller Brass Company,** Port Huron, Mich., recently announced that the **Electric Auto-Lite Company,** Toledo, has acquired a substantial minority interest in the Mueller company. Negotiations under way for several months resulted in an arrangement which gives Mueller a wider market for its products. Electric Auto-Lite now has a large interest in the Port Huron area as it also is the owner of the **American Enameled Wire Company,** South Park, near that city. It also owns or controls a number of subsidiary companies in various other parts of the United States, including **Columbus Auto Parts Company, De Jon Electric Corporation,** and three battery manufacturing plants. Factories are in Toledo, Port Huron, Fostoria, O., Niagara Falls, N. Y., Toronto, Ont., Oakland, Calif., Indianapolis, Sarnia, Ont., and Sydney, Australia.

F. J. H.

Wisconsin Notes

April 1, 1932.

Gordon Metals Corporation, Milwaukee, refiners of non-ferrous metals, reports February shipments were more than 50 per cent above January, which was 40 per cent above the same month in 1931. With one exception February was the best month in a year and a half.

David G. Janes, 80, former Mayor of Racine and a director of the **Wisconsin Metal Products Company** of that city, died in a Chicago hospital March 15. Mr. Janes was active in civic and business affairs of Racine.

Aluminum Goods Manufacturing Company, Manitowoc, earned a net profit in 1931 of $906,225.73, according to an announcement by **George Vits,** president, This is $73,784.66 less than the profit for 1930. The directors considered it advisable to reduce the April 1 quarterly dividends payable 15 cents per share. The dividend paid in 1931 was $1.20 a share.

W. T. N.

Pacific Coast

Los Angeles, Calif.

April 1, 1932.

Central Machine and Manufacturing Company, 1401 South Los Angeles Street, is making a small home type of air washing and conditioning machine.

Metallic Manufacturing Company, metal stampers and spinners, are in new quarters at 1114 West Washington Street. They have 15,000 sq. ft. of space. **Lawrence Russell** is president.

Merit Manufacturing Company, 7725 East Florence Avenue, is building a new plant at Alameda and Baker Streets, Compton, Calif. They manufacture water heaters.

Corser Carburetor Manufacturing Company, 5006 Central Avenue, is manufacturing a new type of carburetor. **J. W. Corser** owns the firm.

B. O. Jessen Sheet Metal Works, East Jefferson Street, has enlarged its plant for manufacture of smokeless heaters for frost protection of orange groves, etc.

Alsix Company, Santa Monica Avenue, making toilet tank balls, has established distributing offices in nine cities and is shipping to every state.

Hi-Priss Metal Letter Company, East 48th Street, is producing a new type metal sign letter in dull porcelain and gold leaf. **Carleton Kinney** heads the firm.

Gaffers and Sattler, East 50th Street; makers of stoves and heaters, has ac-

quired Crown Plating Company, also of East 50th Street, and now have 73,000 sq. ft. of plant space, doing all its work from foundry to finishing.

J. W. Minder, Santa Fe Avenue, has enlarged his chain and gear plant.

De Fou Pen Company has established a plant at 154 West Colorado Street, Pasadena, Calif., to produce fountain pens. **C. H. Hatch** is president.

Auto Electric Food Machinery Company, Shattuck Avenue, Berkeley, Calif., is making a new type of aluminum home cooker, as well as stoves and utensils.

Kay-Bruner Company, located near San Fernando Road, is making a new alloy called "Kaloy."

Western Plating Works, 631 South San Pedro Street, reports improved business, with considerable demand for chromium plating.

Pioneer Novelty Company, 86 Third Street, San Francisco, is producing a new type of coin vending machine.

Premier Spring Company, 1333 Willow Street, has been established for manufacture of upholstery springs. **N. Scholzen,** owner, formerly operated **Twin City Spring Company,** Minneapolis, Minn.

Bedell Engineering Company, electric refrigerator equipment, has purchased a brick building at 54th and Santa Fe Avenue.

Borden Sign Company, 1070 Folsom Street, will manufacture signs and name plates.

Alseth and Strom, 2637 San Pablo Avenue, Oakland, Calif., is making metal toys.

Wilbro Company, 145 Stewart Street, San Francisco, will manufacture hose couplings. **B. F. Williams** is manager.

West Coast Sanitary Manufacturing Company, Seattle, Wash., will manufacture plumbing supplies. Company has acquired **Repcal Brass Works,** and **Maritz Thomsen Investment Company** is interested in the enterprise.

S. B. Glacier and Sons, 212 Stockton Street, San Francisco, are making casting gold and dental alloys. They plan plant enlargement.

Harvey Machine Company, South Los Angeles Street, plans to go into metal stamping on a large scale.

H. S.

Correction

Our February issue gave a somewhat erroneous report of the activities of the Wheelite Distributors, 1737 East 7th Street, Los Angeles, Calif. George Wheeler, well known steel expert, is associated in the firm with Charles H. Smith and Percy R. Longley. The firm manufactures welding fluxes, rods, metal alloy hardeners and other products for improving physical structure of alloys. It has developed a method of casting copper welding rods for arc or torch welding of steel without flux. Other fluxless welding rods are being developed. Another experimental activity is the development of a means of preventing electrolysis between steel and copper in salt water.

Other Countries

Birmingham, England

APRIL 1, 1932.

The British Industries Fair at Birmingham last month proved the most successful ever held. The number of trade inquiries showed a definite increase over previous years. Reports from exhibitors in the metals group, which constituted one of the most important sections, were of a most encouraging character. The number of new non-ferrous alloys for industrial purposes showed an increase, and notable achievements in the ferrous metals also attracted a good deal of attention.

The changeover of Britain's fiscal system coincided with a marked fall in prices of standard copper, but was some recovery in the early days of March. Values fell to £32 on March 2, but by March 10 had improved to £34. The general flow of business has been retarded by the fluctuations, and there has been an absence of buying for forward requirements.

Orders in the Midlands trades have been on a slightly improved scale. Aluminum hollow ware makers have been well employed for some months, and business booked at the Industries Fair will keep them active for some time to come. The home market is hampered to some extent by the general depression, but there are signs that an all-round improvement in domestic buying is on the way. Several of the export markets remain closed to the British producer. Disturbances in the Far East militate against development, but on the other hand the difference in the rate of exchange has enabled openings to be made in Europe.

Since Britain went off the gold standard certain departments of the brass foundry trade have noticed a welcome improvement in business. Large quantities of articles in reproduction brass are being manufactured in Birmingham factories. Formerly these were made in Germany and sent over to England in bulk, but this is now impossible.

There are strong hopes that the introduction of the tariff March 1 will see the beginning of better things among the many manufacturers of small metal goods in the Midlands. Among the goods exempted from the general ad valorem import duty of 10 per cent are the following: gold and silver bullion and coin; platinum in grain, ingot, bar or powder; metallic ores, concentrates and residues; scrap metals and waste; copper unwrought, whether refined or not, in ingots, bars, blocks, slabs, cakes and rods. J. A. H.

Business Items—Verified

Metro Oil Burner Company, Easthampton, Mass., will begin operations shortly.

Amercan Brass Company, Waterbury, Conn., has booked a contract for 800,000 pounds of Anaconda No. 85 red brass pipe for a Long Island hospital.

Easton Brass and Machine Company, Easton, Pa., was slightly damaged by fire recently, which did not interfere to any great extent with business.

Union Metal Manufacturing Company, Canton, Ohio, has a contract for the furnishing of approximately 5,000 lighting standards for the city of Evanston, Ill.

Norton Company, Pittsburgh, Pa., has postponed indefinitely construction of a projected new warehouse and garage. Company is a large maker of grinding wheels.

Diamond Metal Weather Strip Company, Columbus, Ohio, is continuing the business heretofore operated as a partnership. **Henry H. Metters** is general manager. This firm operates the following departments: rolling, stamping, polishing, lacquering.

Telerad Manufacturing Company, Baltimore Life Building, Baltimore, Md., will manufacture electrical devices and equipment. **John L. Strickland** and associates are organizers. Plant operates tool room, stamping, soldering, lacquering and japanning departments.

Manitowoc Iron and Metal Company, Manitowoc, Wis., has been incorporated with $50,000 captal stock to succeed partnership of thirty-three years between David Balkansky and A. Schwartz. **David Balkansky** is president. **A. Schwartz** is no longer affiliated with the organization.

Wakefield Brass Company, Vermilion, Ohio, reports that it is keeping 65 employees busy eleven hours a day, six days a week. **F. W. Wakefield** is president. The following departments are operated: tool room, cutting-up shop, stamping, soldering, brazing, plating, polishing and lacquering.

Lamp-Time Corporation, Milwaukee, Wis., has been organized to manufacture and distribute a complete line of combination electric clock and table lamps. The firm plans on doing an international business, dealing exclusively in combination clock-lamps. The following departments are operated: casting shop, soldering, polishing, lacquering, Japanning.

Rocky Mountain Plating Works, Pueblo, Colo., has installed "Udylite" cadmium plating process, under license from the Udylite Process Company, Detroit, Mich. It is the only such in-

stallation between Kansas City and the Pacific Coast, it is stated. **William H. Ratchke** manages the firm; **James A. Murphy** of Boston has joined the firm as plating expert.

Sanitary Appliance Company, Inc., Houston, Tex., contemplates installation of equipment for hot dip galvanizing or hot dip lead coating of sheet metal products, and possibly also equipment for nickel or chromium plating of some of its products. Company manufactures sewage disposal equipment, plumbing supplies, oil and storage tanks, etc. **M. T. Garrett** is president.

I. W. Wilenchik of the **Metallurgical Products Company,** 1227 East Berks Street, Philadelphia, Pa., announces that he has leased a two-story warehouse covering 12,500 square feet of floor space at above address. The Metallurgical Products Company, it is stated, has been a large buyer of scrap nickel, Monel, molybdenum, tongsten, cadmium and special alloys, for the past 23 years.

The Northern Blower Company, Cleveland, Ohio, is now in a position to offer complete lead burning service for such purposes as tank lining, as well as lead castings, etc. **Karl Gross,** well known lead work expert has joined the company in this connection. It is stated that demand for noncorrosive "Norblo" dust and fume recovery systems manufactured by the company has expanded considerably.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

Copper

APRIL 1, 1932.

Small price variations were recorded in copper during March as a fairly steady tone characterized market developments. The opening, however, was specially weak, and for a few days electrolytic copper was on the basis of 5¾ cents delivered to Connecticut points and 5⅞ cents c.i.f. European ports. These prices marked new lows for both domestic and export account. Foreign consumers bought a good tonnage.

European buying continued active for several days. The foreign buying found a reflection in an advance of ⅜ cent to 6¼ cents for export shipment on March 4. There was sufficient buying to absorb all offerings at 6¼ cents, and the export selling basis reverted to 6⅝ cents at which level a substantial quantity was sold. The betterment in prices and demand was due to improved sentiment over the prospect of an agreement among producers for further curtailment of world output of copper. The show of firmness, however, was spasmodic and narrow. Export offerings again appeared at 6¼c Europe without stimulating any great turnover. A special export price of 6c was made on the appearance of new selling pressure, while a quick change placed the export basis at 6⅛c. All these market changes occurred during the first two weeks of the month. Since then the market has been steady at 6c delivered Connecticut and 6⅛ c c.i.f. European ports.

There was a noticeable lack of general domestic demand. Present low prices have failed to bring in any new buying of futures of consequence. Considerable attention was paid to reports, that Belgian producers have agreed on plans to restrict production at their Katanga properties in Africa in line with American producers to 20 per cent of capacity.

Zinc

There was a slight price recession in zinc last month to 2.75c East St. Louis as compared with 2.80c for the first half of March. Some business was done early in the month at 2.75c St. Louis basis after which the market advanced 5 points with the lifting of selling pressure for a short time. Prices moved indecisively within a narrow range, reflecting dull demand and considerable uncertainty. A more favorable statistical situation attracted a little attention, although stocks are still large.

Tin

Active consuming buying was the feature in tin recently. The volume of buying by domestic interests was the best in many weeks. Purchases, however, were mostly for nearby requirements. No particular interest was displayed for future deliveries. Prices moved within a comparatively narrow range, the variations for the first three weeks of March being less than three quarters of a cent per pound on prompt Straits tin.

Speculative trading was on a large scale in the London market. Fluctuations were also wide in that quarter reflecting the operations of prominent dealers. Producers have united to protect the market from sudden and pronounced declines. Advices indicate that with this object in view adjustments are being made to bring production in line with consumption.

Tin prices have gained a little over a cent a pound since early in January, and restriction of production has undoubtedly been a factor in preventing more adverse

Lead

Conditions in lead have been highly unfavorable to market stability. Prices were on the down grade last month and showed losses of ¼c per pound compared with the March opening. Buying was moderately active in the first half of the month, but with keen competition in selling quarters and a large increase in stocks a heavy tone developed. These various influences proved too much for the market and the price fell to the New York level of 3 cents per pound. This is the lowest price since 1897 when the low quotation was 3 cents. In 1896 the historic low of 2.67½c was touched. Present price contrasts with a high of 12¼c in 1917. The February statistics revealed an increase in stocks of 5,676 tons, bringing total surplus holdings to 165,933 tons, against 122,826 tons February 28, 1931.

Aluminum

There has been little actual change in the aluminum situation lately. Industrial activity is taking less metal than normally finds its way into consumption. The market position, however, is maintained on a profitable basis for the new product. Consumption by the automotive and allied industries is at retarded speed owing to the restricted manufacture of new cars. Some improvement is noted in demand for other manufacturing purposes.

Remelted aluminum has been in fair demand. Outlet for this grade was at a moderate rate and supplies were ample.

Antimony

There were several weak spots in the antimony situation which sent the price of Chinese regulus down to 6½c duty paid. This is a decline of ⅞c per pound since early in February. Continued lack of demand prevailed most of the month. Indications are that consumers have allowed their stocks to run down to a low point. Sudden development of important inquiries might easily create an upturn in market prices. Production and exports in China fell off last year, but stocks at Changsha and Hankow underwent an increase recently.

Quicksilver

A price advance in quicksilver to $75 per flask reflected a firmer tone in this market. This compares with quotation of $67 at beginning of month.

Platinum

No important changes are reported in this market, and refined platinum continues to quote $37.50 an ounce.

Silver

Dealings in silver were on a substantial scale, but bullion prices were maintained on a fairly steady basis. There was considerable aggressive buying both inside and outside of speculative circles. Reports of actual and probable purchases by Mexico and Cuba, as well as advices that South Africa is to expand its coinage of silver currency, has had a favorable effect upon sentiment regarding future developments for the metal. These developments are being watched and studied closely, not only by producers, but by statesmen, economists and large financial interests. Conflicting opinion exists as to a solution of the silver problem. But there seems to be a general agreement that international action is necessary to consider conditions and find a remedy to place silver on a stable basis in all countries. Price of silver in New York this year has varied between 28⅞c and 31c per ounce, whereas in 1931 the fluctuations were between 25¾c and 37¼c.

Old Metals

Trading in old metals was on a moderate scale and at low prices. Months ago business was done at what were considered extremely depressed quotations, but since then even lower prices have been established in line with the weakness in new metals. Reduction in primary material have been followed by repeated price cuts for all secondary grades. Holders who have decided to liquidate have sold at the best prices obtainable. Export inquiry was more active lately as prices eased off. Domestic buying was also better. Even on present conditions there is caution among buyers.

The Wrought Metal Business

By J. J. WHITEHEAD

President, Whitehead Metal Products Company of New York, Inc.

APRIL 1, 1932.

Gradually governments, including our own, are balancing their budgets, and to a certain extent the various metals are doing the same thing. In the case of the metals it is a question of curtailing production so that it balances consumption or preferably is below consumptive demand. All the metals now have large stocks which must either be used up or cut into to bring about price appreciation that can be maintained. In other words, after we balance production against consumption, and after we start to use up our stocks, we must run along for a while before we can start to increase production.

To accomplish the results which we are all hoping for means a business revival. All metals and all commodities are in the same position after they fully recognize the situation and take the steps which will lead them out of the wilderness.

The copper industry has had conference after conference, the result of each one being a further cut in production. It is essential that the copper industry, as well as every other metal industry start to use up its large stocks of raw materials or to prevent such stocks from increasing. Unless this is done it is almost certain that the industry is going to be in a much more serious position than it is now, or it will not be able to take advantage of a pick up when it does come.

There has been very little change from last month. Copper and its products, and aluminum, nickel and Monel are all marking time. Aluminum, nickel and Monel have been pretty well held in hand and it is almost certain that any increase in demand is going to start to reduce any accumulated stocks. As has been repeatedly pointed out, stocks of these metals are all being carried by the producers, the users having relatively very little metal on hand.

The exploitation and development of new markets by those interested in these metals is being actively pushed, and the next few years will show the results of such efforts. Air conditioning for the home, types of homes built of metal instead of stone or wood, new electrical products, conveniences such as hot water heaters, radio, television, etc., are markets to which metal people are now giving attention.

It is believed that we can expect favorable developments early in June or in the Fall.

Daily Metal Prices for the Month of March, 1932

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	7	8	9	10	11	14	15	16
Copper c/lb. Duty Free												
Lake (Del.)	6.625	6.125	6.125	6.125	6.625	6.375	6.375	6.375	6.25	6.125	6.125	6.125
Electrolytic (f.a.s. N. Y.)	5.625	5.75	5.75	6.25	6.50	6.375	6.25	6.00	6.00	6.00	6.00	6.00
Casting (f.o.b. ref.)	5.625	5.625	5.625	5.75	6.25	6.00	5.75	5.75	5.75	5.75	5.75	5.75
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Brass Special	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	21.90	22.15	22.35	22.25	22.30	22.10	22.35	21.875	22.10	21.75	21.65	21.80
Pig 99%	21.50	21.75	22.00	21.875	21.90	21.75	22.00	21.50	21.60	21.30	21.25	21.40
Lead (f.o.b. St. L.) c/lb. Duty 2¼c/lb.	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.00	3.00
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (Ch. 99%) c/lb. Duty 2c/lb	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.20	6.20	6.20	6.20	6.20
Silver c/oz. Troy Duty Free	31.00	30.50	30.25	30.25	30.25	30.25	29.50	29.75	29.75	30.00	29.75	29.75
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

	17	18	21	22	23	24	25*	28	29	30	31	High	Low	Aver.
Copper c/lb. Duty Free														
Lake (Del.)	6.125	6.125	6.125	6.125	6.125	6.125	....	6.125	6.125	6.125	6.125	6.625	6.125	6.210
Electrolytic (f.a.s. N. Y.)	6.00	6.00	6.00	6.00	6.00	6.00	....	6.00	6.00	6.00	6.00	6.50	5.625	6.023
Casting (f.o.b. ref.)	5.75	5.75	5.75	5.75	5.75	5.75	....	5.75	5.75	5.75	5.75	6.25	5.625	5.767
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.														
Prime Western	2.80	2.80	2.80	2.775	2.775	2.775	....	2.80	2.80	2.80	2.80	2.80	2.775	2.797
Brass Special	2.90	2.90	2.90	2.875	2.875	2.875	....	2.90	2.90	2.90	2.90	2.90	2.875	2.897
Tin (f.o.b. N. Y.) c/lb. Duty Free														
Straits	21.70	21.90	21.75	21.75	21.85	21.90	....	22.25	21.20	21.20	20.80	22.35	20.80	21.858
Pig 99%	21.30	21.40	21.30	21.30	21.35	21.40	....	21.75	20.70	20.50	20.10	22.00	20.10	21.406
Lead (f.o.b. St. L.) c/lb. Duty 2¼c/lb.	3.00	3.00	3.00	3.00	2.90	2.90	....	2.90	2.90	2.90	2.90	3.05	2.90	2.995
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	23.30	23.30	23.30	....	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.														
Ingot	35	35	35	35	35	35	....	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	....	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	....	35	35	35	35	35	35	35
Antimony (Ch. 99%) c/lb. Duty 2c/lb	6.20	6.20	6.20	6.125	6.125	6.125	....	6.125	6.125	6.125	6.125	6.25	6.125	6.192
Silver c/oz. Troy Duty Free	29.75	29.625	28.875	29.00	29.375	29.50	....	29.625	30.00	29.75	29.75	31.00	28.875	29.830
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	....	37.50	37.50	37.50	37.50	37.50	37.50	37.50

*Holiday.

Metal Prices, April 4, 1932

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 6.375. Electrolytic, 6.00. Castings, 5.875.
Zinc: Prime Western, 2.80. **Brass Special, 2.90.**
Tin: Straits, 19.625. Pig, 99%, 19.25.
Lead: 3.00. **Aluminum,** 23.30. **Antimony,** 6.25.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $67. **Bismuth,** 85.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price April 5) 29.00.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $37.50 to $40.00.

Duties: Copper, free; zinc, 1¼c. lb.; tin, free; lead, 2½c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	Duty
Brass Ingots, Yellow	4⅝to 6½	45%
Brass Ingots, Red	6¼to 8½	45%
Bronze Ingots	7 to 9½	45%
Aluminum Casting Alloys	19 to22	4c. lb.
Manganese Bronze Castings	18 to35	45%
Manganese Bronze Ingots	6 to10	45%
Manganese Bronze Forgings	26 to35	45%
Manganese Copper, 30%	17 to25	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	7¼to10	45%
Phosphor Copper, guaranteed 15%	9½to14	3c. lb.
Phosphor Copper, guaranteed 10%	10 to15	3c. lb.
Phosphor Tin, no guarantee	27 to40	Free
Silicon Copper, 10%	17 to35	45%
Iridium Platinum, 5%	$42.00	Free
Iridium Platinum, 10%	$44.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	4⅛to 4⅜	Free
Light Copper	3½to 3¾	Free
Heavy yellow brass	2⅛to 2⅜	Free
Light brass	1⅝to 1⅞	Free
No. 1 Composition	3¼to 3½	Free
Composition turnings	3 to 3¼	Free
Heavy Soft lead	2⅛to 2¼	2½c. lb.
Old Zinc	1 to 1⅛	1½c. lb.
New zinc clips	1⅜to 1⅝	1½c. lb.
Aluminum clips (new, soft)	11 to12	4c. lb.
Scrap aluminum, cast, mixed	3½to 4	4c. lb.
Scrap aluminum sheet (old)	8½to 9	4c. lb.
No. 1 pewter	11 to11½	Free
Electrotype and Linotype	1⅞to 2⅛	2½c. lb.*
Nickel anodes	20¼to22¼	10%
Nickel sheet clips; rod ends (new)	23¼to24¼	10%
Monel scrap	6 to 9	3c. lb.

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective February 25, 1932.

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled	15⅜c.	2½c. lb.
Bare wire	8½c.	25%
Seamless tubing	14⅞c.	7c. lb.
Soldering coppers	15⅞c.	45%

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound

Net per lb.	High Brass	Low Brass	Bronze	Duty
Sheet	12½c.	13⅝c.	14c.	4c. lb.
Wire	12½c.	13⅝c.	14c.	25%
Rod	10¼c.	13⅝c.	14c.	4c. lb.
Brazed tubing	21⅝c.		24⅝c.	12c. lb.
Open seam tubing	20¼c.		21¾c.	25%
Angles, channels	20¼c.		21¾c.	12c. lb.
Seamless tubing	15¾c.		17⅛c.	8c. lb.

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	21c.	10% Quality	24⅛c.
15% Quality	23¼c.	15% Quality	28⅛c.
18% Quality	24½c.	18% Quality	31⅝c.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.)	
Tobin Bronze Rod	14c.
Muntz or Yellow Metal Sheathing (14"x18")	14⅝c.
Muntz or Yellow Rectangular sheet other sheathing	14⅝c.
Muntz or Yellow Metal Rod	11¼c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (April 5) 32.25c. per Troy oz. upward, according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	6.25	2½c. lb.
Cut Lead Sheet (base price)	6.50	2½c. lb.

BLOCK TIN AND BRITANNIA METAL SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, April 4, 1932

ANODES

Copper:	Cast	17½c. per lb.
	Rolled, sheets, trimmed	16⅜c. per lb.
	Rolled, oval	14 c. per lb.
Brass:	Cast	17 c. per lb.
Zinc:	Cast	10½c. per lb.

Nickel:	90-92%	40c. to 45c. per lb.
	95-97%	42c. to 46c. per lb.
	99% cast, 44c. to 48c.; rolled, depolarized, 45c. to 49c.	

Silver: Rolled silver anodes .999 fine were quoted April 5 from 32.25c., per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full disc open buffs, per 100 sections, when purchased in lots of 100 or less:

11" 20 ply 64/68 Unbleached	$13.37 to $14.45
14" 20 ply 64/68 Unbleached	21.60 to 23.70
11" 20 ply 80/92 Unbleached	17.00 to 17.55
14" 20 ply 80/92 Unbleached	26.37 to 28.90
11" 20 ply 84/92 Unbleached	21.69 to 21.90
14" 20 ply 84/92 Unbleached	35.37 to 36.15
11" 20 ply 80/84 Unbleached	21.69 to 21.90
14" 20 ply 80/84 Unbleached	35.37 to 36.15

Sewed Pieced Buffs, per lb., bleached ..... 41c. to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) granular, 99½+%	lb.	.04½-.05
Chromic, 75 to 400 lb. drums	lb.	.13½-.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06-.06½
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	14.30-21.00
Denatured drums	gal.	.356-.436
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.04
Ammonia, agua, 26 deg., drums, carboys	lb.	.02¾-.05
Ammonium sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide	lb.	.28-.37
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax, granular, 99½+%	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.08
Chrome Green, bbls.	lb.	.20
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.14-.20
Cyanide (100 lb. kgs.)	lb.	.39
Sulphate, bbls.	lb.	.038-.05¼
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar, bags	lb.	.04½
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.32-.34
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, 100% synth., drums	gal.	.41½
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.18-.20
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls.	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.50-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¾
Silver Chloride, dry, 100 oz. lots	oz.	.27¼
Cyanide (fluctuating)	oz.	.35
Nitrate, 100 ounce lots	oz.	.23¾
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate	lb.	.05-.06¼
Nitrate, tech., bbls.	lb.	.03¼-.07
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate	lb.	.21½
Sulphocyanide	lb.	.28-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.25½-.27
Tripoli, powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, drums, bbls.	lb.	.07½-.10
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½